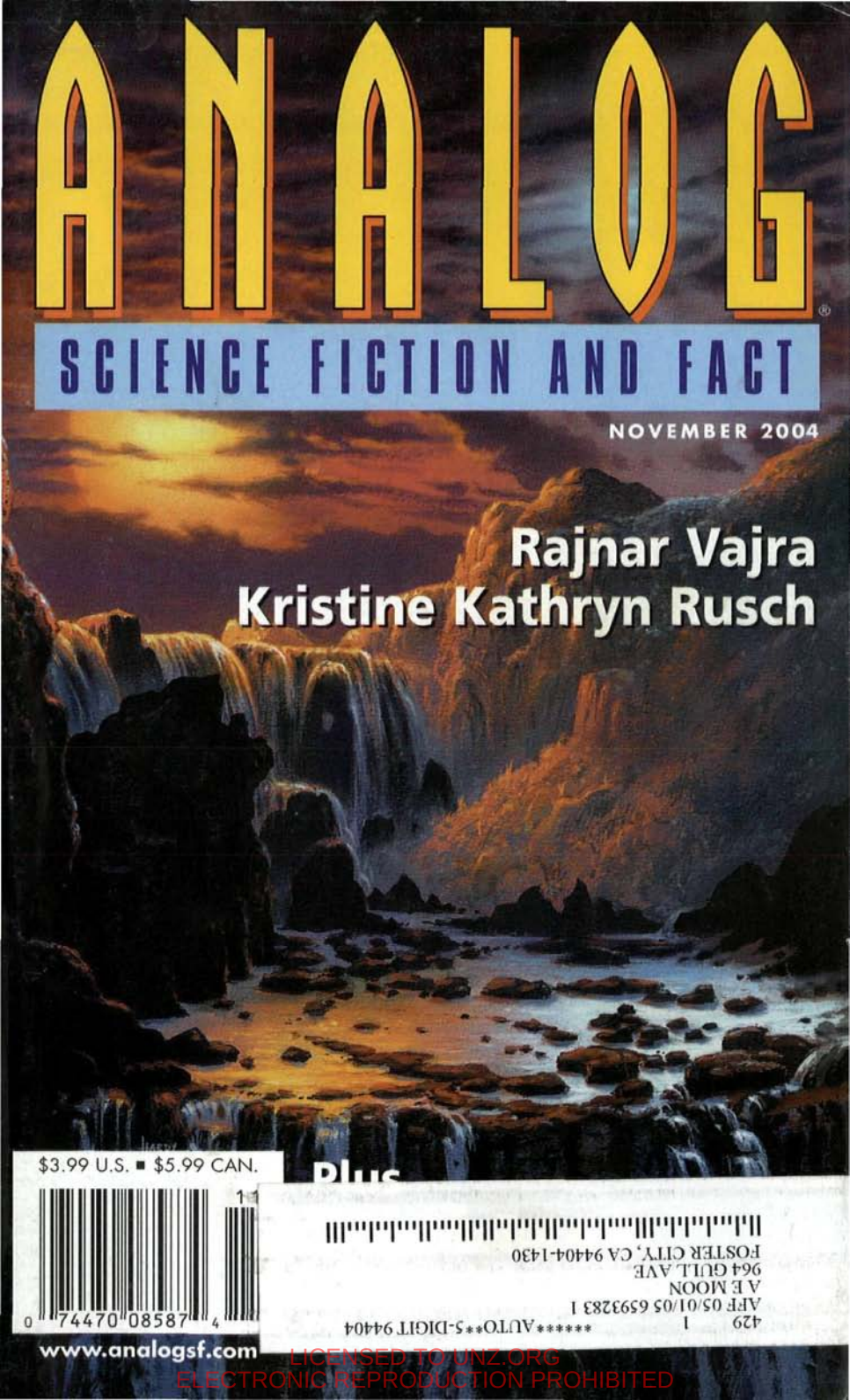

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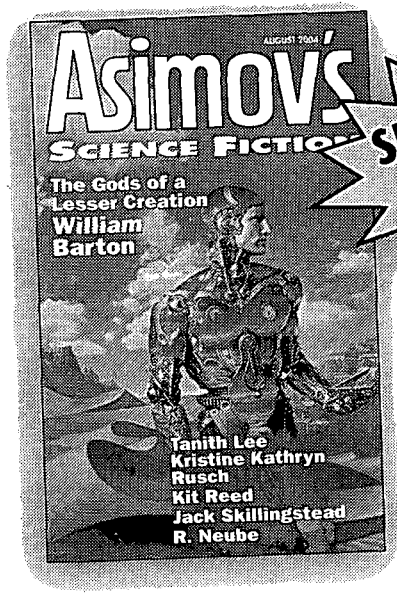

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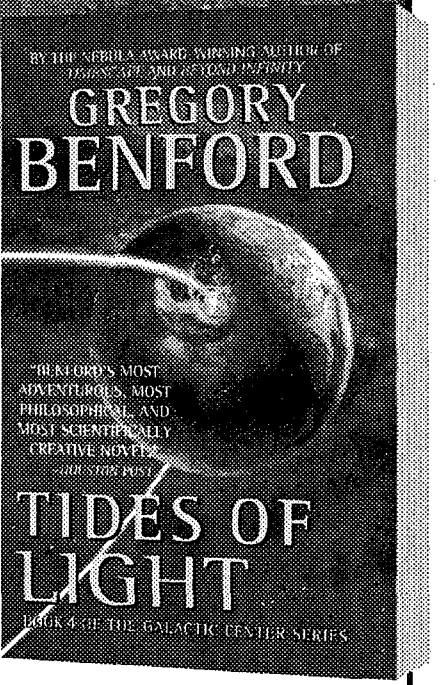
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SCIENCE FICTION AND FACT

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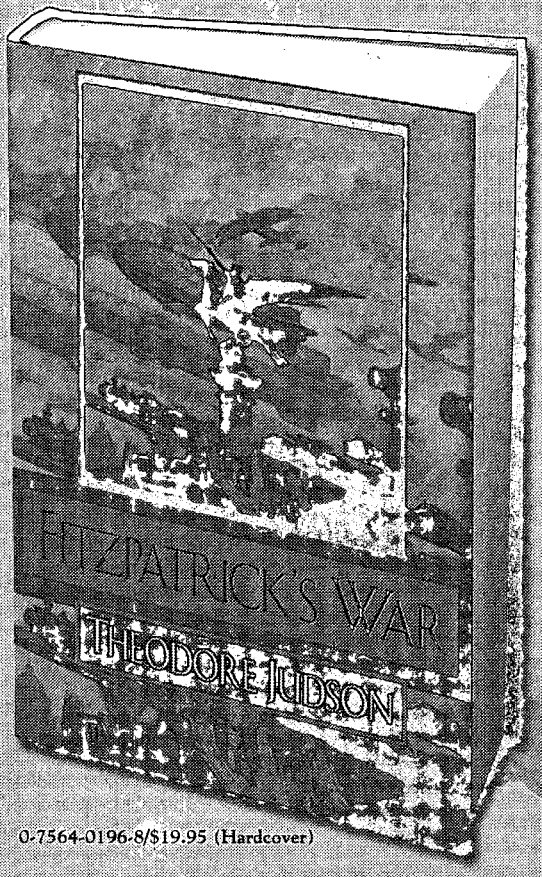

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EDITORIAL Stanley Schmidt

ATTACK OF THE GIANT OXYMORONS

One of the funniest bits I've ever read was a brief scene in Robert R. Chase's first *Analog* story, "Seven Scenes From the Ultimate Monster Movie" (Mid-December 1984). A cub reporter at a newspaper (whose main qualification is nepotism) has just composed his first major headline:

GIANT MICROBES INVADE CENTRAL EUROPE.

Upon seeing it, his editor (and father-in-law) dismisses it as "absurd." "'Giant microbes,' indeed!" he scoffs. "It's an oxymoron. Change it."

So the neophyte dutifully rewrites the offending headline:

GIANT OXYMORONS INVADE CENTRAL EUROPE.

In the real world of 2004, I often have the uncomfortable feeling that much of the world, not just central Europe, is suffering an invasion of giant oxymorons. And while it's funny on one level, it's sad and disturbing on others.

It isn't really new, of course. People in many places have often shown an uncanny ability to do one thing while proclaiming loudly that they're doing something else, or to slam two words together with no apparent inkling that they're about as compatible as protons and antiprotons. But such word games have seemed to me particularly rampant of late.

The particular one that got me started was a recent automobile review in a newspaper that gave the car's price as "$84,000: $75,000 base plus $9,000 required options."[1]

Required options? Are they required (in which case they're part of the *real* "base price") or are they options (in which case nobody has to take them or pay for them)?

The phrase "required options" is as good a textbook example as you could ask of an oxymoron in its simplest and clearest form: a noun modified by an adjective with a meaning inherently contradictory to that of the noun. But oxymorons can be more complicated and subtle, if no less silly. The American Heritage Dictionary defines *oxymoron* as, "A rhetorical figure in which incongruous or contradictory terms are combined, as in *a deafening silence* and *a mournful optimist*." And rhetorical figures can be considerably more involved than a noun plus an adjective.

For example, I've heard all of the following in recent public discourse (some of them repeatedly as minor variations on a theme, so my "quotations" are actually careful paraphrases distilled from two or more slightly different actual wordings):

• Legislators in some states have banned the sale of "junk foods" such as candy bars, soda (or pop, depending on where you live), and potato chips in

[1] Numbers rounded off because (a) I don't remember the exact figures, (b) I don't want to identify either the car or the writer too specifically, and (c) they're not important enough to my argument dig up for a second look

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school vending machines. The idea is to combat the "obesity epidemic" among American children, which is almost certainly a good idea, though whether this is the best (or even a good) way to go about it is open to debate. Regardless of where you stand in that debate, how could you not be impressed by the oratorical skills of those officials promoting the ban by glowingly saying it "gives students the opportunity to make healthier choices"?

Basic observation of simple logic: You don't give anybody the opportunity to make any kind of choices by eliminating some of the options. Taking all the "junk food" out of the vending machines merely *deprives* students of the opportunity to make *unhealthy* choices. That may be good for the obesity epidemic, but bad for developing the ability to make intelligent or healthful decisions. If you *really* want to "give students the opportunity to make healthy choices," you put nutritionist-approved choices like fruits and vegetables in the machines *along with* the junk foods, and try to make the students understand why they should choose the veggies oftener and the junk foods less often. Maybe it's really better, for some reason, to instead take the opportunity for choice away—but if that's the case, please don't lie about what you're really doing.

•In a somewhat similar vein, I recently heard an announcement that a legislator was pushing for mandating a longer waiting period between getting a marriage license and getting married. The official proudly proclaimed, if my radio was working properly and I understood it correctly, that this would "grant every engaged couple more time" to make sure they really wanted to take this drastic step. No doubt many engaged couples *should* take more time to be sure they're doing the right thing, but plenty of others have already taken plenty of time and done the necessary homework before applying for the license. Forcing them to wait still longer is not "granting" anything at all; it is, quite simply, denying them the opportunity to make their own decisions as responsible adults. Any couple can already wait as long as it wants between license and wedding; nobody needs a law to "grant" them that.

Freedom is meaningless unless it includes the freedom to make mistakes. To say that you're "granting" something when you're taking something away adds insult to injury and mocks a basic principle of life in a country that claims to value individual freedom and responsibility.

•Many politicians through history have led their countries into war "to ensure peace." I'll grant that, if you're careful and/or lucky, war will eventually be followed by peace, and actions taken in the course of the war may in some way contribute to that peace. But such phrases as "a war to ensure peace" encourage reckless attitudes that may lead to out-

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comes quite different from those desired. The only thing that starting a war *ensures* is war—so it needs to be undertaken very carefully, as an extreme last resort, if peace is really what you're after. As Kelvin Throop observed, nobody ever prevented a war by firing the first shot.

•In what might be seen almost as a corollary of the preceding, I have recently heard government mumblings about a possible need to reinstitute the draft, to ensure adequate manpower to protect freedom. The oxymoron here is one of bitter irony: forced labor is proposed in the name of liberty, even though one is the very antithesis of the other. Yes, a country must be able to defend itself, and in the particular case of this country the constitution expressly gives Congress the power to raise and support armies. But it also expressly forbids involuntary servitude, which, from the basic definitions of the words, clearly includes conscription. Maybe very special circumstances can make it necessary, temporarily—but if and when that happens, it's more important than ever to view it as a temporary aberration forced by unusual events rather than the government's right to invoke at will. And everyone, public officials most explicitly included, would do well to think long and hard on the suggestion by Robert A. Heinlein (himself a naval officer) that a society that can't muster enough voluntary defenders isn't worth defending. (Which does *not* mean that such a society should necessarily be abandoned—but it may need to change its ways, and its people may need to lead the way to such changes.)

It's true that for a significant portion (though by no means a majority) of its history, the United States has relied on conscription to fill military ranks. The last and longest such period ended in 1973, shortly after the Viet Nam War, so there's a whole new generation of young men and women who may soon have to face the prospect of conscription but have no personal (even secondhand) experience with it as a reality. If a real and provable necessity for such a thing arises, so be it. But in that case, let it be done with a full awareness and understanding by all concerned of just *what* is being done, and why, and what a serious step it is—not a glib attempt to conceal all that by pretending it's something it isn't.

All the examples I've given can be viewed, at least superficially, as mere

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oxymoronic rhetoric, and as such amusing. But they can also be seen, particularly if you pause to reflect that some people take them quite seriously, as something rather more sinister. George Orwell coined the word *doublethink* to describe something at least uncomfortably similar. *Webster's Third New International Dictionary* defines it as "the keeping of two contradictory ideas or opinions in one's mind at the same time and the conscious belief in both of them." It was central to the world of his novel *1984*, in which the three core slogans of the ruling party were WAR IS PEACE, FREEDOM IS SLAVERY, and IGNORANCE IS STRENGTH.

But war is not peace, freedom is not slavery, and ignorance is not strength. Nor is taking giving, a requirement an option, or a prohibition an opportunity. If we want to be sure we never blunder into a world like Orwell's, we must try always to speak honestly and carefully. We must think rigorously about what each word we use or hear means, and resist the temptation to be lulled by comforting doublethink. And we must teach our younger citizens to do the same.

Meanwhile, we shouldn't forget that, dangerous as these word games are, they do have their humorous side—and humor can ease the way past many hazards. Maybe some of the people who say things like "required options" are genuinely unaware of the contradictions and irony in their utterances. Maybe they're *trying* to be funny. Or maybe they're just emulating the Lewis Carroll character who said that when she used a word, it meant exactly what she wanted it to mean.

Maybe. But we would all do well to remember that if too many of us do that, words can cease to mean anything at all—but they will still have profound effects on what happens in our world. ■

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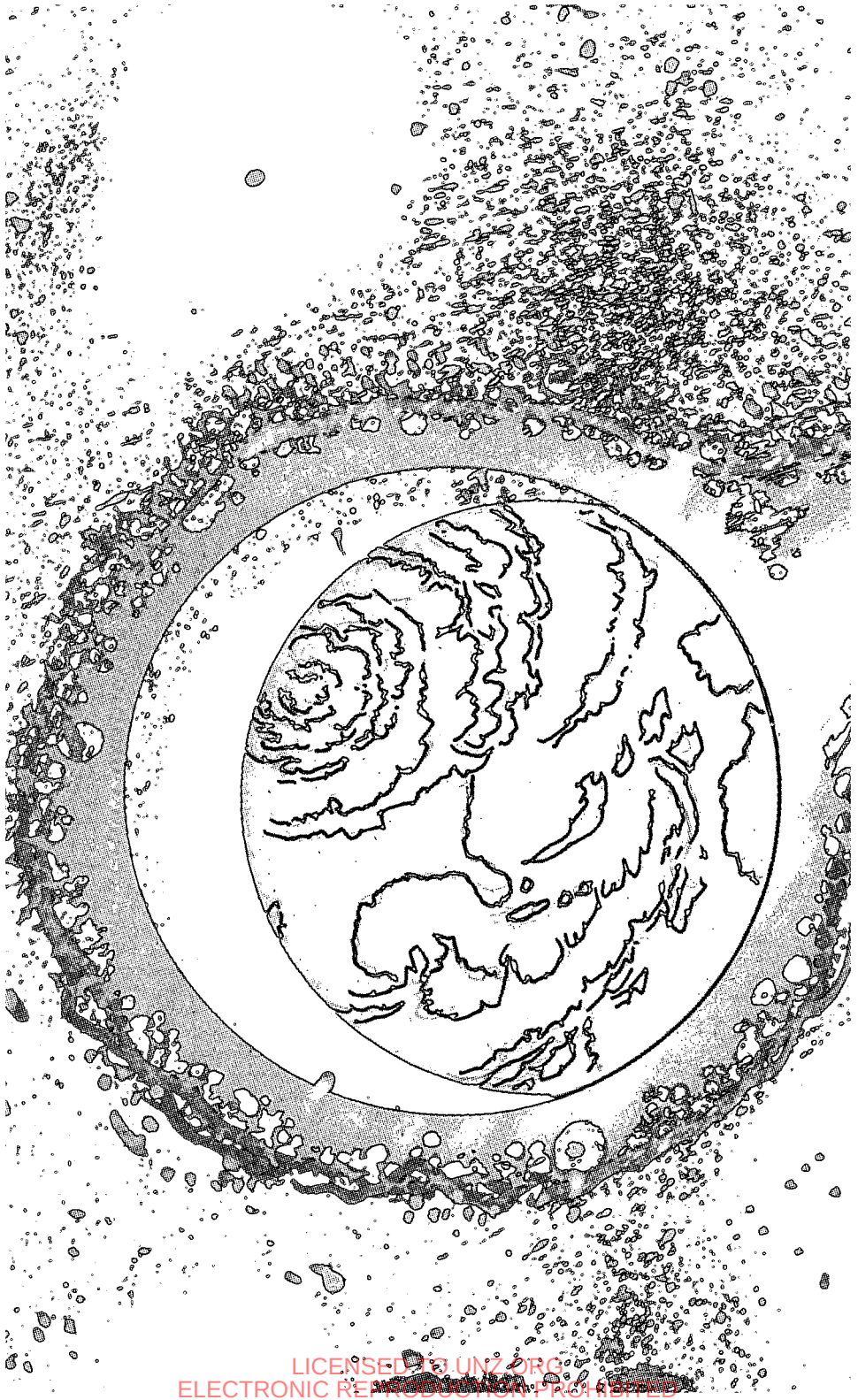

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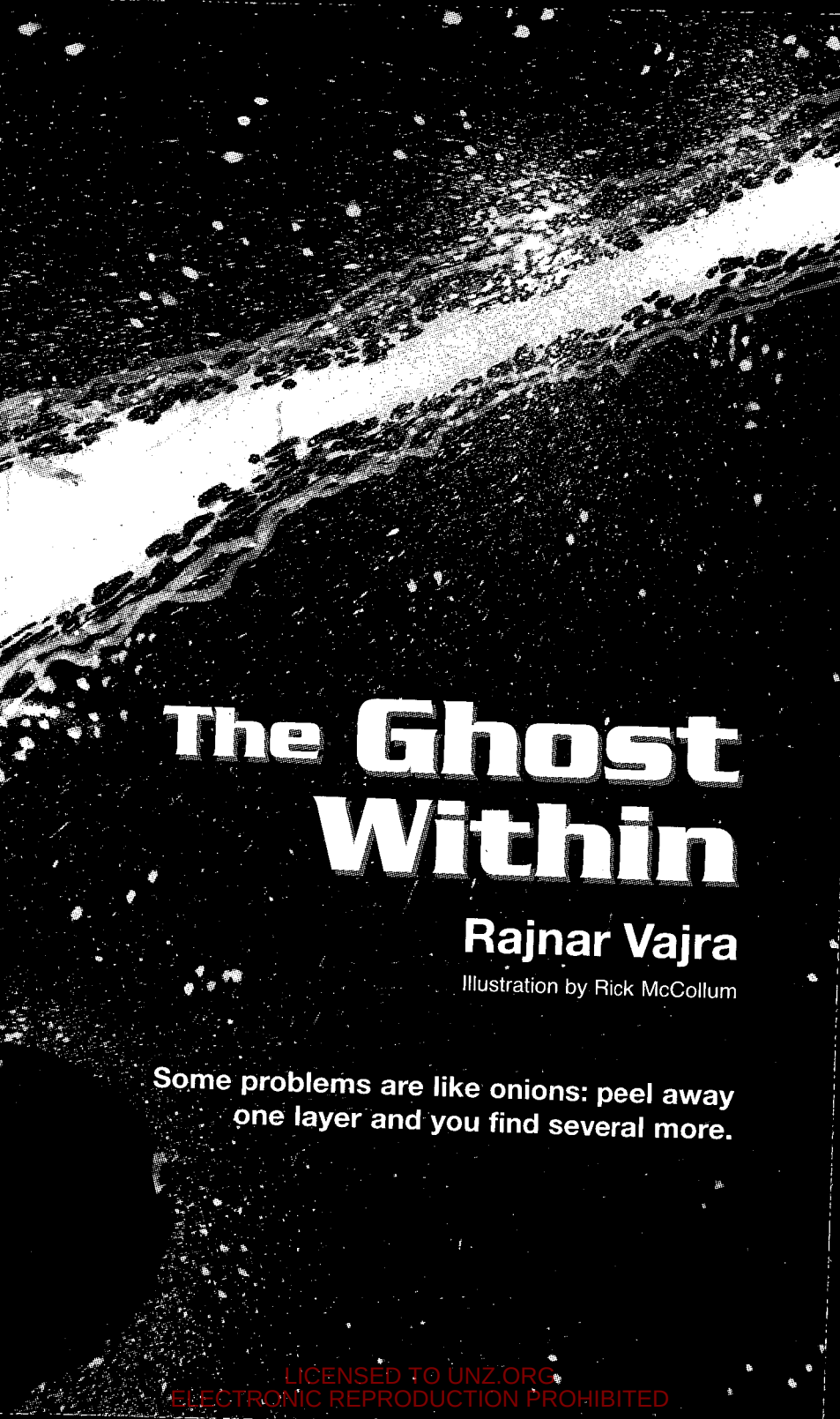
The Ghost Within
Rajnar Vajra
Illustration by Rick McCollum
Some problems are like onions: peel away one layer and you find several more.

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The job was three kinds of weird before it even began.

On a blistering July afternoon in 2019, I was in my office, leaning back in my custom-made chair, bare feet resting on my desk, trouser-legs hiked up far enough to expose two large and hairy calves. I'd angled my size-thirteens toward the portable fan, trying to get at least my lowest extremities comfortable.

Fat chance. The ancient fan had developed a death rattle and a case of the slows over these long days of the worst heat wave in Ohio's recorded history, and the poor thing couldn't even cool itself. Thena and I refused to buy a new one out of principle. Considering what we were paying for rent, we weren't supposed to *need* a fan.

My partner, Athena Gregory, an oversized pixy with ideas as varied and strange as animals in the Columbus Zoo, had reluctantly admitted it was her turn and had just departed on a cold-brew replenishing mission. I was supposed to be doing paperwork, but instead I'd been leafing through a book of Zen koans until I stopped on this puzzler:

A monk asked Fuketsu: "Without speaking, without silence, how can you express the truth?"

Someone accidentally offered a solution by knocking on the pebbled-glass insert of my office door. I jumped a bit because a warning buzzer is supposed to sound, here in what Thena calls the "inner sanctum," whenever our hallway door opens. It'd buzzed when she'd left, but perhaps it, like my deodorant, had finally succumbed to the heat.

"Come right in," I called out, shoving the book aside, getting my legs under the desk, and sitting up. I didn't bother with peripherals such as shoes.

The odd couple shuffling into the room wasn't my usual breed of clientele. They were seriously overdressed for the weather—hell, a thong would've been suffocating. Both were wearing knit sweaters. The man looked about eighty years old and was maybe six-one if he could manage to stand straight. His face was pinched and scholarly—assuming scholars spend their off-hours sucking lemons. His companion had elfin features like Thena, only this woman was far tinier and, from the wrinkles, a millennium older. One or both were wearing a heavy lilac perfume.

"James Q. Carlton?" the scholar asked. "The private detective?"

"Guilty as charged."

The man licked his lips, which were pale and cracked. "I hope it's acceptable that we wandered in without calling ahead."

I waved my hand, granting permission for assorted peccadilloes. "Sorry about the sauna effect. The air-conditioner broke down a week ago and they promise to deliver a new one the instant we don't need it."

"We don't mind a little warmth, Mr. Carlton," he said, raising his voice to carry better over the fan. "I'm Dr. Raymond Fisk and here is my associate, Professor Dorothy Grahame."

I pushed back my chair and stood up to shake hands. My guests' eyes widened as I rose. Their faces registered the dismay of homeowners observing a new volcano sprouting up on the front lawn. Being six-eight plus is mostly a damn nuisance. Their palms were amazingly dry.

"Pleased to meet you both." I tried not to *sound* like an imminent eruption. "How can I help you?"

Fisk looked over at Grahame, but her mouth had dropped open and her eyes were glazed. She'd noticed my immodest collection of American art glass and had lost interest in the normal world. Genuine Tiffany pieces can do that to you. You think you know what beauty is....

Fisk gave up on her. "You were recommended to us by Superintendent Montgomery of the Chicago Police De-

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partment."

"How kind of him." But hardly surprising. Superintendent Montgomery happens to be my uncle. Hugo, renowned for his ability to turn the briefest interaction with any media journalist into useful publicity. Hugo emits evening-news sound bites such as "I never trust a drunk or a gun when they're loaded" with the ease of a duck emitting quacks.

Fisk's mouth warped into something nearly a smile the way a piranha is nearly a goldfish. The disturbing expression only lasted an instant, but in the sweltering office I felt a chill touch on the back of my neck. He probably had a twinge of heartburn, I told myself.

"Dottie and I," he said, "are founding members of the ICRO, the International Cryptozoology Research Organization, currently headquartered in Chicago. Do you happen to know, sir, what cryptozoology involves?"

"I think so. Searching for species thought to be extinct, or species unknown to science. Hunting around for the nearest coelacanth and, say, King Kong."

He nodded but his lips turned south. "More or less. We have a task we'd like you to undertake for us."

Whatever they wanted, it wasn't going to be our typical case. Thena and I mostly do insurance investigation, usually trying to discover if some heirloom declared stolen by its owner was, in fact, stolen. Amazing how often the missing treasure turns out to be wedged behind the credenza, or has been lifted by some relative or friend who's been offered a slice of the settlement. . . .

I sat down, waving my new friends toward the second-hand, or at least second-rump, Aeron chairs near my desk. Fisk had to pull Grahame's sleeve to drag her attention off an opal-glass vase.

"Tell me more," I said in my friendliest manner after everyone was seated. "As it happens, right now we're free to consider a new project." As it happened, bills were due.

"Do you believe," Grahame said, "in ghosts, Mr. Carlton?" Her voice was improbably deep and rich.

I tried to keep my eyebrows from denting the ceiling. "I haven't thought about it much, Professor. I guess you could call me an agnostic on the subject."

Her smile turned the furrows around her mouth into deep parentheses. For the first time, I noticed that her gray eyes, behind thick rimless glasses, were as probing as searchlights. And her face, beneath its fractal wrinkles, showed signs of long illness.

Now that I wasn't lounging, sweat was pasting my shirt to my back. My clients apparently had no such problems; neither face wore the least sheen. Maybe they were ghosts themselves.

"What," I asked, "do ghosts have to do with cryptozoology? Wouldn't . . . spectrology be more the right field?"

They glanced at each other. I got the impression they hadn't been surprised by the question per se, but that a Neanderthal knew the word "spectrology."

Grahame leaned forward slightly. "That depends, young man, on what, precisely, a ghost is. Many reports of 'ghosts' involve such phenomena as cold spots and amorphous shapes. Why should such sightings have anything to do with deceased individuals?"

"Good point. But don't tell me you've come all the way from Chicago to hire my firm to track down a *ghost*?"

"Hardly, Mr. Carlton. I'm afraid it's unlikely that you are qualified for such work. Please don't be offended."

I had to grin. "I'll try to keep my spirits up. As it happens, they didn't offer specter hunting where I went to school. And please call me Jimmy." A touch of informality helps ease tension, and people who come to a detective agency tend to be wound tighter than a golf ball.

"Unfortunately, the man we want you to investigate is also nicknamed Jimmy," said Grahame. "Which may make our

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discussions a bit confusing."

"I take it this fellow's heart still beats?"

My visitors exchanged glances again. Fisk regained the floor by clearing his throat. "It isn't the man we are concerned about primarily, but the rather remarkable claim he's made."

"Go on."

"He claims to have trapped a ghost and is offering to sell it to the highest bidder."

That was an eye-blinker. "And my job would be?"

"To determine this individual's trustworthiness. He's starting the bidding at a high figure and we want to know if his character guarantees his guarantee."

I took a second to sort that one out. "He's offered to return the money if the buyer isn't satisfied?"

"Precisely."

"Fine. Give me his full name and address, if you have it, and I'll—"

He'd raised his palm, traffic-cop style. "Mr. Carlton . . . Jimmy. We'll expect more from you than pure research. We want you to accompany us back to Chicago and conduct your investigation from there." He glanced at his hand, seemed surprised at its elevation, and let it drop. "This should only take a few days. Not only will we want you to keep in close contact with us, we'd like you to observe the man in person. Superintendent Montgomery declared you a marvelous judge of people."

"Did he? I'll have to run this past my partner, but I don't think she'll have any—"The buzzer rattled half-heartedly; apparently the vacation had done it some good, but not enough. "Hold on, that's probably her now."

Thena opened the door gently; somehow, she always knows when a client's in the office. Her fine hair was limp, red-blond strands plastering her lightly freckled forehead. She was a heat-drenched soggy mess, but compared to Fisk and Grahame, she looked impossibly young and pretty. She was carrying a paper bag almost Grahame's size and, considering the way her arms were straining, somewhat heavier. I hurried over to assist.

"Good lord, Thena, did you buy the entire store?" I muttered.

"Only the liquids."

I stuck the bag on the refrigerator in a corner while performing amenities, introducing Thena by her full name. She shook hands, rolled her chair over from her sanctum desk, and sat quietly while I filled her in. She absorbed the notion of purchasing ghosts without a twitch.

"How are we getting to Chicago?" she asked. "It'll take over four hours by car, assuming we swing toward Toledo and catch I-80 at—"

"That won't be necessary, dear," Professor Grahame interrupted. We've a private jet parked at your local airfield, with a thoroughly expert pilot."

"Thoroughly expert" seemed an odd choice of words, unnecessarily reassuring.

Thena caught it too. She gave me a questioning look before glancing at her wristwatch. "Do I have time to go home and pack?"

I was seated next to Grahame on the brief flight to Midway Airport. Lounging back in my leather-covered seat, enjoying an abundance of legroom, sipping an iced raspberry soda with a splash of fresh lemon, I idly tracked our progress though the sky on a monitor mounted on the seatback in front of me. My one gripe was that the seat's massage control was designed specifically for right-handers. Why are so many engineers prejudiced against my kind? On the screen, the icon representing our jet was bigger than Chicago and I hoped we weren't going to crush the city when we landed. While I was enjoying myself, Grahame was busy prying into my life. I was too comfortable to protest.

"Your partner is exquisite," she said just loudly enough to be heard over the

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jet-roar. "So tall and beautiful. Are you two an item?"

I grinned, more at the term from *Bringing Up Baby* than at the idea of Thena and me as a couple. "No. She's happily married to a good friend of mine. Besides, I've known her since preschool; we don't think of each other in romantic terms."

"I was so admiring all those vases and lamps in your office."

"Thank you. I admire them myself. Daily."

"One wouldn't expect to find such things at a detective agency. Do they belong to you? That dragonfly lamp appeared to be genuine Favrile from the Tiffany studios."

Internally, I bought several more shares of Grahame, Inc. "You've got an eye, Professor! A few years back, I inherited some money and decided to invest it in art glass rather than stick it in the bank or into some mutual fund."

"How wise. I imagine the value has appreciated faster than any mutual fund."

"Definitely, but that's not why I did it. My dad, who was one hell of an artist, taught me to love the stuff. And since Athena and I work for several insurance companies, we get a nice discount on our premiums."

"You sound like a shrewd young man. I'm delighted we found you. Ray and I are a bit beyond our depth here and we need all the shrewdness we can muster."

"We'll do our best."

The temperature as we stepped from the plane was a shock. Apparently, the pleasure of camping out in a pizza oven hadn't confined itself to Boon, Ohio.

Thena and I hadn't had a chance to talk privately before the flight, but our hosts invited us to wait inside Midway's air-conditioned terminal while they arranged with their pilot to get us home after the job was over.

We laid claim to two seats in the waiting area nearest the gate.

"What's the story?" I asked.

"Assumptions, assumptions."

"One little suitcase."

She grinned. "You *are* a detective."

I'd better translate. I wanted to know what she found out about our clients after she went home, supposedly just to grab some clothes. She teased me, asking what made me assume she'd done such research. But I know my Athena. She'd usually pack more than this for a day trip.

She got serious. "The International Cryptozoology Research Organization exists. No website, but the word 'Cryptozoology' pulled up mega references and links. Our clients were listed as founders. Both published scads of papers years ago, but none for decades. Few of those papers seemed related to zoology."

"Oh?"

"Fisk is a wizard in biophysics and holds a bucket of patents. Grahame's a world-class chipset designer and a patron of the arts, one of the modern breed."

"Modern breed?"

"Affluent people, usually middle-aged women, who write grant proposals rather than forking out their own money."

"Let's hear it for grantsmanship! I've known plenty of artists who'd appreciate being better endowed. Speaking of which, Grahame was trying to peek under my hood on the way over. She wondered if we were an 'item.'"

Thena's smile made the Mona Lisa's seem blatant. "Fisk was asking questions, too, but they were all about you. He was subtle like a crowbar."

"What'd he want to know?"

"Not anything you'd expect. He noticed those Japanese books of yours in the office and asked what else you were interested in."

"Really?"

"And he wondered how well you did in school."

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"Wow. And no questions about you?"

"Only as a way of spotlighting you. He asked my opinion on how . . . intellectually flexible you are."

"What did you say?"

She looked at me sweetly and patted my hand. "That mental rigor mortis set in long ago. Under torture, I broke and admitted that you were a nut for antique glass, antique movies, and antique Zen when it comes with pretty illustrations. Here come our employers. Did you notice how dry their hands are?"

Our cryptozoologists seemed a bit scandalized when Thena and I insisted on sharing a double at the Sheridan. Once, on a seemingly harmless case, we'd gotten into some boiling water because we were sleeping in separate rooms. Since then, the rule was to constantly watch out for each other when in the field.

We set up shop in our new home, plugged our laptop into the hotel's cable jack, and while Thena used the Internet to check out J. Potts, I made phone calls to the same end. We'd barely begun assembling information when it was time for us to meet the clients down in the lobby. They'd made an appointment with the ghost-seller and wanted us at hand. One peculiar fact we unearthed: James Earl Potts was the chief technician of a unique company: Live Forever.

At his insistence, we met Potts outdoors at the University of Chicago, near Cobb Gate. He wanted to look us over before conducting business; if he found the sight of us bearable, he was willing to receive a grand in cash as "earnest money."

Potts was a scarecrow with a constant tilt to starboard; maybe his right leg was short. He had large, watery brown eyes, tan shoulder-length hair—shaggy, but his forehead showed a hint of male pattern baldness. His arms and upper lip were so long that I suspected he might enjoy brachiating now and then.

He was waiting as we approached Cobb Gate's fancy arch and he'd brought along an ally of his own: an ogre of a man introduced only as "Cal." Cal eyeballed me, mumbled something about the "Jolly Green Giant," and drifted to a position directly behind Potts, which visibly and audibly annoyed the entrepreneur.

"Christ, Cal. Go home if you don't think you can back me up here."

"Whatever you say, Jimmy. But you'll owe for the whole day. Maybe I'll see you around sometime, Giant." Cal winked at Thena and eased off like a man on vacation.

Potts glared at the receding back and rotated the glare toward me. "You planning on causing trouble?"

"Me? Never."

"Fine. Near here's a bar where we can talk. You all start walking east; keep going straight until I catch up. I want to make sure you four are the whole party and I want the big guy where I can see him."

If he was being this cautious, surely the ghost-bidding was starting *very* high.

The bar was a throwback: smoke-filled, which meant a nearly-impossible-to-get smoking license, and gaudy with neon signs whose rotating parts created the illusion of lights spiraling and beer bubbling. At Potts's insistence, I tried the local microbrew but decided it had to be an acquired tasteless.

Fisk cleared his throat. "Mr. Potts, we would have dismissed your fantastic claim out of hand, except—"

"Except that I work for Live Forever, which gives me access to some very special equipment. Right?" His tone bothered me; he sounded like an actor rehearsing lines while trying to sound spontaneous. He glanced at Thena and scowled. "What's *your* problem, lady?"

His irritation didn't remove Thena's micro-smile. "I just think it's interesting

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that extreme wealth doesn't block extreme gullibility."

It was Potts's turn to smirk. "So you figure Live Forever is a scam?"

Live Forever promised to provide immortality through digitally storing a person's complete personality and memories.

"It's an old idea," she remarked, "but a stupid one. Even a perfect electronic copy of someone isn't the person."

"Tell you what. I'll let you try it out and you'll change your mind."

Thena looked surprised, which on her meant one eyebrow had lifted a sixteenth of an inch. "I thought you had to be near death for the process to work."

"Typical misconception, lady. If you're young and healthy, I can move you into e-heaven and right back again no sweat. In fact, I'm going to *have* to send someone in there to prove I've got the ghost. You volunteering?"

My partner shook her head faintly.

Potts shot me a grin. "Looks like we'll have to go with Jolly Green." He turned his gaze toward Fisk. "One thing I can't figure: I told a buddy of mine to pass the word to a few specific . . . collectors he knows. The IRCO wasn't on his list. How did you find out about my proposition?"

Fisk shrugged. "A claim such as yours spreads, sir."

Grahame tapped on the tabletop. "Why do you believe that the entity you've captured is a ghost?"

The technician inhaled a long drink of overpriced beer before answering. "You understand how uploading works?"

"Not the specifics," she admitted.

"We use MRI and MIS to form a complete model of the subject's brain and its behavior. Then we—"

I'd raised a finger. "I know what MRI is, but what's MIS?"

A sneer didn't enhance Potts's beauty. "Magnetic Inductive Stimulation. We use it to test impedances between individual nerve cells, map proprioceptive connections, chart the most often used—"

"I get the general idea."

"Yeah, right. Basically, we wind up with a *program*. One mother of a complex application. If we install and run it on our system while the modeled wet brain is functioning, the program repeats an elaborate but identical cycle. But if we use MIS to interfere with the wet brain's higher functions, the program instantly develops variations and classic brainwave patterns. Subjectively, the subject wakes up inside e-heaven. We've learned that identity is largely a matter of habit."

I frowned. My opinion of Potts needed tweaking. "You know this from personal experience?"

"I've gone back and forth three times. One moment, you're in your body. Next moment, you're . . . I can't describe it. Martin Trobbani, my boss, says that we've learned how to give the soul an IP address."

"All very interesting," Grahame broke in, "but you still haven't answered my question."

"First, just a few more facts: we needed a way to test hierarchy protocols without the risk of overwriting a patron and getting sued by the relatives. So we set up several emulated minds and left them running. These models behaved predictably until three weeks ago."

"What changed?" Fisk asked.

"One of our wooden puppets began making brainwaves like a real boy."

Thena and I traded uncertain looks.

Fisk pursed his lips. "Perhaps you've created the first genuine artificial intelligence."

Potts tapped his own forehead. "My thought exactly. But when I asked the patrons, they told me different. Believe me, they know the score. And so will you after your big boy goes inside."

I had mixed feelings about this idea, all bad.

Live Forever, hogging an entire floor of the new Hartley Building, reminded

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me of a bank. Polished brown marble floors and it even had a vault: a massive airlock blocking out dust and outside noise. To my distress, Fisk and Grahame had offered me a cash bonus for mental guinea pig work, so huge that I couldn't justify turning it down. And despite myself, Potts had spoken so glowingly about e-heaven, my overactive curiosity had woken up and demanded to be fed.

Which is why, after much external and internal arguing, I found myself naked, lying on my back on a cold plastic table, festooned with electrodes, waiting for God knows what to happen to me.

I didn't have long to wait.

My skull resonated with a basso humming as white auroras filled my head. My sense of direction evaporated. Then, the strangest feeling arose as if I were standing up and someone or something huge and powerful was standing right behind me. I couldn't turn to look. I . . .

SSchaSScha! TaTaTaTaTaTa! ZZahZ-Zah!

Fireflies blazing in rainbow buzzes. Smoke, ouroboros, swallowing its own tail. Lemon smell and lemon-coated fear. The noise sweats and shivers. Grapefruit bitterness trickles through my eyes, turning to abysmal sweetness in my throat. My tongue is heavy sugar, radioactive. The world is a loom for salted cobwebs, airy and too loud. Is that a wall? I try to grab on to it. It collapses into paper-thin tissue in my . . . do I have hands? I try to scream and what pours from my mouth is cotton candy, spun meaning, already deflating . . .

Keep very still, sonny. Try to relax.

"Who said that?" How the hell can I hear such a soft voice in such a racket?

Welcome to the pseudoverse. You aren't alone.

"Where am I? What's wrong with me? Is this supposed to be e-heaven?"

A second voice chuckles: *Right now, it must seem like fair dinkum e-hell, eh?*

A third voice, high and wispy: *let there be light!*

A spark, a flash, a torrent of brightness. I weep twin suns. . . .

Second voice: *Steady, cobber. If you can see now, focus on a single spot. Trust us, we've all been through the same wringer.*

The heavy Australian accent coming from a disembodied and directionless voice wasn't exactly a sign of returning normality, but I picked a point of pickled random. "Okay. Uh, I'm focusing."

High voice: *Describe what you see.*

"Five dots, I guess. They're close together and two of them have little . . . rivers attached. I can't tell what's flowing exactly, but one stream is, um, hot gold, the other is a cold green. Hey! The streams just traded colors!"

Second voice: *Good job. You're taking a gander at a simple switch; possibly a light switch and that's the good oil, mate. Follow the gold river backwards. Don't worry when it reverses hue—alternating current should bloody well alternate—just stick with the same river and she'll be apples. Give us a travelogue along the way.*

As I described the eccentric scenery, my invisible guides interpreted my sensations with some quibbling among themselves; apparently experience here was somewhat individualized. Before long, I was spotting junction boxes, serial ports, VLSIs and a slew of related objects on my own. When the guides figured out precisely where my awareness was centered within the enormous circuit I seemed to be traversing, they began issuing directions.

First voice: *Take the top river on the left now; stick with it until you reach the second potentiometer.*

"I'm there."

Take the thinnest river now, that's the "wiper."

Finally, after dozens of instructions, I arrived at a new kind of device. "What's this?"

Rather than answering directly, the Aussie voice suggested I put myself in-

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side the stream of golden light and let it flow through me. Nervously, I obeyed. I still had no sense of what kind of "body" I was moving around in, or how I was moving it.

All I saw for a long time was dazzle with a sandy texture. Then, in one startling instant, my mind imposed order to the bright chaos and I found myself staring at something familiar: Thena's white-zinfandel hair.

"You guys led me to one of the room cameras!"

High voice: *you're a quick study, friend.*

Quick? It must've taken me fifteen minutes to figure it out! Then I noticed something strange: Thena seemed to be frozen. Instinctively I tried to rush forward, which only shrank my field of vision. So I stepped back, as it were, until I could see more of the room. Potts, my partner, and the clients were crowded around a body lying on a table and nobody was moving.

"This camera's acting as a web cam," I announced. "I seem to be looking at a single frame."

Anechoic laughter.

Second voice: *You got that wrong, mate. Time flow here is bloody subjective, and you can diddle with it once you find your private speed-knob.*

I stared harder, trying to infuse motion into the scene by sheer will, and was startled when some of Potts's split ends began drifting. The next few moments were crazy as everyone in the room jerked around in fast-forward and then refroze in new and unbalanced positions. Gritting imaginary teeth, I kept trying to make my personal seconds and the outside world's match, which proved frustrating as hell and reminded me of the first time I tried to deliberately wiggle my ears.

Still, I was making progress when I noticed something that scared the ectoplasmic crap out of me. Potts's head had moved aside enough for me to confirm that the big fellow on the table was me. What put the icing on my nightmare was that my corpse began twitching.

I had my all-time worst thought: one of Live Forever's customers had escaped and was taking over my body, and I was going to be stuck here forever. . . .

First voice: *When you think that loudly in here, sonny, you might as well be shouting. But you're wrong on all counts. Your flesh isn't moving without you. The young lady was raising hell and Potts is channeling some of your virtual nerve impulses back into your meat to prove that it's still alive.*

"Hold on! You can *hear* what they're saying out there? How is that possible when they're barely moving?"

Chuckle. Then: *Live Forever wouldn't have gotten off the ground, without two-way communication between their uploads and the outside world. Hang around long enough you'll master the art yourself. The tricky part is learning to work different time rates concurrently.*

"Sounds tricky, all right. But thanks for easing my mind! What else am I wrong about?"

Your attitude. You were spooked at the idea of being trapped, but you can't imagine the life you can make for yourself here. You wouldn't believe the range of possible experiences.

"Such as?" One thing about being separated from one's glands: you don't get stuck in any particular emotion. I'd gone almost instantly from freaking out to calm curiosity.

Can you see me yet?

"No. Should I be able to?"

Try to imagine . . . a green ball in front of you.

I tried. "Nothing yet."

The ball is spinning and glowing.

"I see it!" As my belief strengthened, the green brightened a bit. The nearly transparent sphere had a faint lime-peel surface texture and contained a small blue blob suggesting a cell's nucleus. "Is that you?"

It's how you're seeing me right now. A little suggestion lights the way here. Fol-

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low me.

The ball zoomed off and I zoomed right behind. We moved through a gate of some sort, zipped briefly along a silver stream, and then stopped within a complex bundle of devices. From the patterns, I recognized a camera and various electronics, but most of it was unfamiliar.

"I'm guessing you want me to stand in the golden light?"

Yes.

I could see what the new camera was seeing almost immediately, I just didn't believe it. "Is that the *Earth* I'm looking at? Where the hell are we?"

Free minds such as ours, my friend, can fling perception wherever the Internet goes.

"Anywhere?"

Right now, we've placed our awareness in the Circumluna Space Platform. We travel in "shakes," not miles, and arrive without moving. In my personal world, we flew here.

I kept staring at the Earth. "What's a 'personal world'?"

After you master e-heaven skills, you can couch your sensations in whatever form pleases you. As far as my individual experience is concerned, I live in the penthouse of a crystal castle ten miles tall, and most gods would envy my powers. Exhilarating, I assure you!

"You mean . . . we're in *The Matrix*?"

As in the movies? Hardly. Objective reality, if you can call it that, remains. It's merely tailored to fit our personal whims. You see that red cable near you?

"You mean the violet one?"

A trivial distinction. In my world, that red pattern is emblazoned on a heraldic shield to show that it's a shielded cable, but we both recognize it as a cable. Now, I brought you here to experience something specific. Look for a junction where the camera's gold data blends with two other colors.

"Okay, I've spotted it."

Go there and let the combined colors flow through you. Tell me what you experience.

At first the image was too bizarre to sort out. Even when it finally sprang into focus, I was confused.

"Well, I see the Earth again, in hyper-Technicolor for sure, and the sun and a heap of stars. But the world is surrounded by flowing patterns of some kind of . . . fog, somewhat squished on the dayside, streaming far into space on the night-side. Almost as if the whole planet is a partly submerged submarine, leaving one hell of a wake. Geometrical. Pretty, too."

Excellent! You're a natural! The image is so colorful because you're already integrating infrared and ultraviolet wavelengths from specialized recorders. Of course, you automatically transpose the colors to those you're familiar with.

"And the fog?"

Magnetic fields. Your "wake" is Earth's "magnetotail," shielded from the solar wind. Do you begin to see why I would feel suffocated with merely human senses? There's much more, but your time here may end at any moment. I propose we return to home base, essentially a matter of shifting perspectives, and introduce you to the reason Potts put you here.

"Damn!" I said, shadowing the green sphere as it retraced our path. "This has been so amazing that I forgot why I came! Do you really have some kind of specter hanging out?"

Ah. Something arrived fairly recently.

"Not a ghost?"

You can decide for yourself.

We passed though the site of the laboratory camera and I positioned myself to snatch a peek inside the lab—everyone had changed position. Then I had to hurry to catch up to my guide, who finally stopped at a major junction point amid a dense forest of massive chips.

Suddenly, we weren't alone. Past the green sphere, I noticed a red pyramid, a tubular orange infinity sign, also something resembling a yellow hex-nut. Every shape was translucent and each

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had its own subtle blue nucleus.

"Maybe it's time for introductions," I said. "I'm James Carlton. Not, I trust, the *late* James Carlton."

Green ball: *We know who you are. Intent is palpable here, so we'll always know whom you're addressing, but for those who feel more comfortable with names, I go by Galahad.*

High voice, the infinity sign: *Gwennyth Overlake. Call me Gwen.*

Second voice, the pyramid: *Wally Jones—from the land up over by my globe.*

A new basso voice associated with the nut spoke: *Muriel Waters here.*

"Nice to meet you all. How many of you patrons, uh, live here?"

Galahad: *Thirty-nine, so far. Not including you, of course, since you're only visiting.*

"Okay. Could someone lead me to the ghost, or whatever it is?"

Gwen: *Unnecessary. From this bus we can track everyone in the circuit. Your ghost is on its way here.*

Before I could absorb this interesting news, something utterly bizarre pushed its way between the ball and pyramid.

I felt cool plastic beneath my body and opened my eyes to find Thena staring down at me. Potts and the clients were also watching but they weren't leaning over, or fighting back tears.

"How do you feel?" my partner murmured.

"Wha' happened?" My voice was slurred.

She glanced at Potts then grabbed one of my hands and squeezed. "I was about to ask the same question."

"I don't know, Thena! A few seconds ago, I was talking with these . . . personalities in the weirdest place you can imagine. Then this *thing* appeared and before I could get a good look, I was back here."

As my partner straightened up, I caught the expression on Grahame's face. Satisfaction? Triumph? I think she noticed my stare because her features hurriedly smoothed into an attitude of mild concern. What was going on here?

Potts's smile seemed forced. "From the sound of things, you learned enough to back up my assertions."

"I'm not sure," I admitted. "Look, I'm a bit woozy, maybe we could sort this out later?"

Fisk patted my head the way I'd pat a favorite dog. "You should rest. Will you give us a few days, Mr. Potts, to reach a decision before you explore other options?"

"Two days. After that, I'll take bids from anyone."

Leaning a bit on Thena and Potts, I stood up and waited for a new wave of dizziness to ebb. While I got dressed, the clients arranged a ride to the hotel for us hired helpers. They planned to stay behind to discuss "details" with the entrepreneur. Getting down to the haggling, perhaps.

Before our taxi taxied off, however, Grahame knocked on my window. I rolled it down and she leaned in; lilac perfume filled the cab but I got a whiff of something less sweet underneath. "If you feel well enough tomorrow," she said, "continue your investigation of Mr. Potts."

Thena leaned across me to face the older woman. "If we give him thumbs-up, how do you plan on carrying off your purchase?"

"That isn't your concern, dear; but once he supplies the proper software, we can transfer our 'purchase' to any sufficiently large data system. Driver, you may leave now."

During the ride, I tried to describe my experiences among the non-angels of e-heaven but gave up when everything I said seemed to give the wrong impression. The hotel bed felt incredibly soft when I lay down. I really was a bit woozy.

Next day, I got the first unmistakable clue that something was seriously

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wrong with me. It didn't happen until shortly after noon, but even at 7:00 AM, when Thena's MP5 alarm clock started blaring Paganini's *Perpetuum Mobile*, the world seemed very much . . . askew.

Three times that morning, I walked around the room, munching on some fruit that pretended to be breakfast, scrutinizing walls and furnishings. Thena noticed, but one of my favorite things about her is that she knows when I'm not ready to talk about something.

At least our investigation went smoothly. A few hours sufficed to gather all the hard information we needed about Potts. By eleven-thirty, we not only had everything from his SAT scores to his latest phone bill, we had a horde of data about his friends, *their* credit histories, and even where they hung out when off the clock. Interviews were in order.

One Calvin Dobczka received occasional checks from Potts and we figured that was economy-size Cal. According to a police report made after a bar-fight, Cal was an afternoon regular at a tavern named "Myke's" three miles from the hotel. It seemed as good a spot as any for our first interview. After a quick lunch in the Sheridan's smaller restaurant, we hailed a cab and were on our way.

Myke's wasn't as deep a dive as I'd been expecting, but a jacket and tie weren't mandatory—possibly not even a shirt. The place smelled of fresh beer, old spilled beer, and grilled fish. The customers smelled much the same. We had to push our way through quite a crowd to reach Cal.

He wasn't hard to spot since he happened to be standing. He and I stared at each other above a cloud-layer of gelled hair and balding heads and he didn't seem tickled to see me. He looked down and flipped his fingers in a get-up gesture. Two of his buddies, who'd been seated, joined us in the stratosphere and gazed at me with piggy eyes. Cal was the tallest of the three, but only by a hair and half a freckle. By the time Thena and I had reached the right table, I decided that Cal was far more charming when working solo.

"What do *you* want?" he demanded with the belligerence control set on overdrive. A fog of whiskey breath arrived with his words and it dawned on me that the man wasn't an affectionate drunk.

"We hate to bother you," I said with my best bogus sincerity. "But if you've got a minute, we have a few questions we'd like to ask about Jimmy Potts."

"Why should I answer your damn questions?"

"Potts is your friend, isn't he? A little cooperation could help him reap some big bucks."

"I'll tell you somethin', pal. I don't need Potts and I sure as hell don't need you. And I don't like the smart-ass way you talk. My brothers don't like the way you talk neither." The brothers nodded with all the autonomy of marionettes.

Sometimes I don't know when to keep my big mouth shut. "Would you prefer French?"

That tore it. I have no idea what grievance Cal had alcoholically placed at my doorstep, but he was sufficiently pissed—in both senses—to let his fists answer back. Not only did he start swinging, the puppets waded in as if I'd mortally insulted all goon-hood.

I ducked the first roundhouse, but wedged in by the crowd, I was in trouble. "Get back!" I yelled at Thena, leaning to one side so that my shoulder took a blow aimed at my nose. It hurt enough. At least three fists and one big foot were coming at me from different directions—then it happened. . . .

Remember that scene in the first Toby Maguire *Spider-Man* movie where a high-school jock attacks Peter Parker by the lockers?

Everything around me slammed on the brakes. Suddenly, the punches were moving in slow motion and dodging would've been effortless except that my

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body had become horribly stiff and awkward. Feeling oddly detached from it all, I had to strain to avoid punches moving so sluggishly that I could've counted knuckle-hairs.

I forced myself forward and, by exerting a ton of determination, managed to give Cal's extended right arm a push. Thanks to my semi-paralysis the shove felt weak, but Cal began to spin like the world's laziest ballerina. His extended arm swung around, rising as it moved, until it tapped Goon Two just under the lower ribs.

Goon Two then performed far more impressive choreography: without seeming to try, he gradually floated upwards several feet while leisurely soaring backwards, his body gradually tilting toward the horizontal. By the time he settled, so very gently, on a nearby table, Goon Three's foot was approaching my crotch. Seeing no call for unnecessary intimacy, I brushed the foot aside and watched another pirouette from *Swan Lake* as performed in aspic.

Cal was still spinning despite the contact with Goon Two and everyone had lost interest in me. Since my services were no longer required, I turned my unwilling body toward Thena and reached out to pull her out of danger. The instant I touched her hand, the world sprang into full motion accompanied by a deafening chorus of bangs, snaps, and the crunch-tinkle of shattering glass. More spilled beer to cry over. Cal and Goon Three were sprawled flat on the floor, twitching but not trying to get up. Goon Two was groaning among the flotsam of a broken table.

As reality normalized, my emotions flooded back, bringing a new kind of fear. I was drenched in sweat, panting as if I'd sprinted a marathon. My heart was hammering so fiercely it was shaking my entire body. My muscles, especially those in my arms and shoulders, ached and burned. Thena's eyes were wide but she tightened her grip on my hand and tugged me through the crowd while I was still struggling to calm down.

"Hold it," I gasped when we'd finally gotten outside.

"You all right?"

"Good"—pant, pant—"question."

"Well, can you tell me what just happened in there?" she demanded. "I've seen you move awfully fast for a behemoth, James Quincy, but I've never seen *anyone* move *that* fast!"

My breathing was slowing. "I may have a problem," I admitted, my eyes scanning the sidewalk then the door and brick wall behind us.

"Talk to your Athena."

"Let's walk. I need to keep looking at stuff." I took off and she fell into step beside me.

"May I help you look?"

"I doubt it."

From one corner of my eye, I caught her faint frown. "You're scaring me, James."

I swallowed hard. "I'm scaring myself. I think I might still be in e-heaven and all this," I waved a hand around wildly, "is fake."

"It isn't."

"Easy for you to say, especially if you're an illusion."

She was silent for a moment. "I see. Do you have any way to tell for sure?"

"Maybe. In e-heaven, apparently everyone builds custom realities to suit themselves, but all versions conform to one ... schematic and have similar color-coded symbols."

"Symbols for what?"

"Actual electrical or mechanical components. If one patron finds, oh, the symbol for a diode in a specific location within Live Forever's wiring, every other patron will see something comparable in the same place."

"So that's why you kept staring at the walls this morning!"

"Yeah. Ever since we left Live Forever—supposedly left—I've felt odd. And when I woke up today, the world seemed *tilted*. So I kept checking our hotel room, looking for e-heaven sym-

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bols. The frustrating thing was the sense that I *was* seeing something important, but missing the significance."

"A symbol?"

"No, I don't think so. Although a power outlet could represent, um, a power outlet, I suppose. And the Ethernet jack could symbolize—"

"An Ethernet jack. And the TV could symbolize a TV. What a mind-trap! But what about that color-coding you mentioned? I don't remember the outlets being any special color."

"Right. That's why I figured I was being paranoid . . . until time went nuts in the bar. Hell, I don't see anything on this street that shouldn't be here, except for us. Let's grab a ride and scuttle back to base camp. No more interviews until I can sort myself out."

Cold drink in hand, I rested on the hotel bed, propped against pillows while my partner sat at the room's tiny desk and organized information on our laptop. She was punching keys harder than usual and was sitting just a bit too straight.

"Don't be angry," I said to her back.

"If I don't exist, why should it matter?"

I couldn't believe the way life was suddenly imitating philosophy. "I never claimed the version of you I'm seeing isn't the real you. I just can't be sure."

She saved her work and spun her chair around to face me. "Damn it, Jimmy! I have no idea how you did that Flash routine either, but Potts didn't use that horrible machine on me so I *know* we're in the real world—or as real as it ever was. So there's another explanation. Why is this I'm-stuck-in-dreamland your top choice?"

"Because in e-heaven, you can learn how to control your perception of time. I was told you can even experience events at different time-rates simultaneously! Hell of a trick. . . ."

She sighed. "How are we ever supposed to resolve this?"

"Beats me. I still think I missed something crucial this morning. If I could nail it down, then maybe she'll be apples."

"What?"

I looked at her in surprise. "Maybe everything will be all right."

Thena stared back. "Where do apples come in?"

For a moment, I couldn't believe she was asking about such a common expression. Then my skin erupted with goose bumps.

"My God. I've got your alternative explanation, Thena! I seem to be haunted."

She searched my face before speaking. "Are you serious?"

"Dead serious. I think I picked up a hitchhiker in e-heaven."

"The ghost?"

"No. One of Potts's uploads, an Australian who calls himself Wally Jones."

She licked her lips, which meant she was *really* upset. "This is crazy, I hope you know that."

I just nodded.

She walked over to sit on the bed with me. "All right. Explain."

I reached over to the nightstand and grabbed the last lonely piece of fruit from the basket Thena had scrounged this morning. "This is what I noticed without noticing earlier."

"That Granny Smith?"

"Well, not this very one; I ate the actual evidence. While I was chewing, that phrase 'she'll be apples' kept popping into my head. Wally had used it in e-heaven and I'd gotten the basic idea, but only through context."

"So you decided to import it to America?"

"No. When I woke up today, I knew in my bones exactly what 'apples' meant along with a slew of Aussie slang. It all seemed so natural that I didn't give it a second thought. You remember what Grahame said? With the right software, an uploaded personality can live in any large data system. Nice to know my brain has enough RAM to—"

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"Jimmy." She moved close and wrapped her arms around me. "You're trembling."

"I'm working on that." I spoke through her hair. "I don't know what this thing can *do* to me."

She backed off just far enough so that she could see my face. "What is it trying to do?"

"Good question. Wait." I closed my eyes and when I reopened them, she was still watching me solemnly.

"That was . . . interesting," I said. "I was remembering standing in a dry creekbed, holding a rough black opal the size of my fist, turning it in the sunlight, thinking how gorgeous the colored flashes were going to look when the stone was polished."

"When did that happen?"

"It didn't. At least, not to me. And it turns out that I know plenty about the outback I've got no business knowing. But that knowledge is getting a bit sloppy, starting to fade. My sense is that Wally's digging a hole in my mind and trying like hell to hide something in it."

"Such as?"

"Himself maybe. Thena, I'm afraid he can tell what I'm thinking, at least dimly, because that sword seems to cut the other way."

She took it in stride. "You're reading his mind."

"'Reading' is too strong. All I know so far is that Wally is very upset. Something went wrong for him when I involuntarily . . . sublet my brain. I don't know what or why."

She was silent for a time. "What do we do now?"

"We go lean on Jimmy Potts and I mean *hard*; what happened to me couldn't have been accidental. I'll call Uncle Hugo and see if the CPD will loan me a—a visual aid. Meanwhile, see if you can figure out where Potts would be this time of day."

"You're planning on threatening him with a gun? That's not like you."

Yesterday, that accusation wouldn't have chilled me so. "I'll only play that card as a last resort. And to eliminate temptation—and believe me, I'm tempted!—it won't be loaded. I'll bet you a Tiffany lamp that whatever happens, he won't be filing any complaints."

Potts was still at work. He agreed to a private meeting so readily that Thena and I spent the trip to Live Forever agonizing over the implications. We couldn't come up with an explanation that was anything but terrifying and none of the ideas we batted around, quietly so that our cabbie wouldn't rush us to the nearest loony-bin, pointed me toward any specific way to approach Potts.

He'd been strangely eager to see me and hadn't mentioned my partner, so it seemed best for me to tackle him alone. Thena would wait inconspicuously outside the Hartley building. If I didn't page her on her cell phone within twenty minutes, she'd call 911. Meanwhile, I planned to follow a maxim of my own: sometimes the best offense is a good bluff.

On impulse, I went to the front door rather than the door we'd used earlier. It was locked, but when I rang the bell, Potts himself opened it after a brief wait. He led me through a waiting area with a receptionist's desk but no receptionist present and down a hall past offices likewise uninhabited. He said nothing until the thick door sealing the uploading room had closed behind us.

"Any problems?" he asked quietly. Potts seemed a different man, more purposeful. And now that we were face to face, it was obvious he thought I *was* a different man. It took zero brainpower to guess who that man had to be.

I considered faking an Aussie accent, but I since I hadn't used one on the phone. . . .

"What problems would you expect?" I said in a neutral tone.

His cheeks flushed. "I wasn't questioning your competence! It's just that this one appeared so . . . tough."

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My last hope that this was all some crazy mix-up died. I shrugged to mask a shudder.

Then, since I didn't know what question might spotlight my ignorance, I gave Potts the silent stare treatment. Sometimes the best way to squeeze out information is to make someone uncomfortable.

Still, I wasn't expecting the speed or intensity of his reaction. "Should we get things set up for Montgomery," he babbled nervously, "or do you need more time to get the memories in order?"

Montgomery? He had to mean my uncle! Suddenly, I was choking on an emotional paradox: a perfect blend of icy fear and boiling outrage. Potts's attempt to murder me—evict me from my body and substitute an imposter—was apparently only a means to get Hugo here and pull the same dirty trick on him!

And it might well have worked! My uncle trusted me. If Wally could access my memories and speak through my mouth, he could invent a dozen reasons why Hugo would need to personally investigate e-heaven. But what was the point? Why would dead people, if the dearly semi-departed were behind this conspiracy as Thena had speculated in the cab, want a toehold in the Chicago Police Department?

Struggling to keep my feelings under control, I decided to take a chance and try for some confirmation. "I've got the memories all sorted. Remind me, who's going to be running Montgomery?"

I knew I'd blown it when Potts turned pale. Although barely moving, he seemed to shrink far away from me. His mouth worked soundlessly for a moment. "You're still the original Carlton," he finally stammered.

"No thanks to you." My bluff license had expired and I knew it wasn't renewable.

"Don't hurt me!" I'd never seen a grown man cringe like this. "Please! We mean no harm. It's just that we're only academics—*scientists*—and this is such a primitive, dangerous place! We need as much protection as we can get."

I kept staring at him. A good detective, I reminded myself harshly, works with the facts, no matter how fantastic. So I threw all Thena's theories and mine in the trash and purchased a controlling interest in several others. In any case, I seemed to have an unexpected pry bar and the gun could stay in its ankle holster. "I won't hurt you if you do exactly what I ask."

"I'll do anything. Within reason."

I pulled out my phone and pressed the code for Thena's pager. "We'll wait until my partner joins us."

Within a minute, a bell sounded. "That'll be her now. Shall we let her in?"

As we headed through the building, the man seemed utterly cowed. I didn't understand why and that worried me. At the entrance, Thena kept her face blank, but I could tell she was relieved to see me smiling. Which justified how hard I'd worked to smile. After one sharp peek at me, she kept her eyes trained on Potts.

"We can forget your ghost hypothesis," I told her with ersatz heartiness. "There's no Invasion From Beyond The Grave."

"Which leaves?"

"That's where things get interesting. Brace yourself, partner. What *are* you people, Potts? Extra-terrestrials? Incorporeal ETs, at that! Or are you from another dimension? Another time?"

"I . . . shouldn't tell you."

"Maybe you don't need to," I said, admiring Thena's poise when she had to be as shaken as me. "Back to the operating room! I've got an idea."

As we walked, I turned some attention inwards. My sensitivity to my new neighbor was increasing. I now could *feel* Wally Jones inside my mind, a nearby wriggling worm. He was frantically rooting around for something and getting more frustrated by the second. I even got a vague but upsetting impression of what he was seeking: the neurological equivalent to a master control

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panel. Not good. But luckily for me, he was—I can't quite describe it, but *facing the wrong way* comes close.

When we closed the vault door, I turned to Thena. "Kindly entertain Potts while I try something. He isn't a brave sort, so don't give him a heart attack."

From her minuscule nod I knew she'd understood me. "Are you going somewhere?"

"If so, only internally." I lay down on the uploading table, which felt much warmer with my clothes on, and closed my eyes.

In e-heaven, I'd learned how to move my awareness through a system, a trick I would've never learned while in my own body. Just maybe I could use the same technique for exploring another system: my own mind. If it worked, Wally's incorrect . . . posture might give me a chance to sneak up from behind, as it were, and get control over ***him***, or at least steal some useful information.

I tried to forget the outside world. Wally's furious energy made it surprisingly easy. Following the mental equivalent of a slime-trail I approached the worm in my private Mac computer—she'll be apples, indeed—and then, with a final burst of acceleration, I made contact—

The light is right. My cell-cousins glow with extra brightness today in my honor, leaving warmth-comets behind them as they move. I am too tense to enjoy the gesture. I gaze through properly thick glazing at the world below, trying to at least be pleased by the latest extension that has raised the city's wall yet again. Not even most agile beast could hope to leap up a tenth that distance! And already, the next extension is underway.

The sky is a smooth and lovely fire. I understand that the aliens we are currently researching cannot see it that way. Impoverished souls! They will never enjoy the dancing of heat pouring from their sun and rising in response from the ground. Still, I suppose all beings have limitations.

Yellow light flashes! A stranger is on the floor! This one will not have our family shape and may tread carelessly. Injury and pain may result! I must stay alert. . . .

I fear that the stranger is a technician come to lead me to the casting room. So soon? I shiver and moan as is proper. Impossible to imagine living in an alien body, on a strange world, speaking an alien language totally unknown to me now . . .

Speaking? Has anyone informed me that these beings communicate using sound? No. But they do, I know it. I even know some of the words I'll be using. "Australia" is one. A howl, a hiss, a plosive, and some groans. Ugly. The language of vomiting. But I haven't left yet! How could I possibly know "Australia" already? I must warn my . . .

Wait. These are *memories*, only memories—but someone is watching them with me! Someone is—

Wally had caught on. Instantly, he turned from worm to giant snake with a long jaw and matching teeth. He wasn't naturally aggressive—I'd picked that up clearly upon touching his consciousness—but immediate peril was enough to transform his kind from cowards to horrors. And they had resources I was only beginning to discover. With Potts, I'd unwittingly been holding a crocodile by the tail.

Wally leaped at me, jaw open. The urgency that had carried me into the pseudoverse of my own brain had acted as a kind of psychological retaining wall; I'd retained a sense of body image. When his teeth closed, I felt my left hand tearing off, bones snapping and ligaments tearing. The pain was unbelievable, a reification of personal loss, physical grief. He came at me again and I bolted. If he tore off enough pieces of me, I'd lose all identity and then he'd be controlling my body by default.

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Sometimes I felt I was running, sometimes jumping or flying—anything to get away. But he stayed right on my tail, teeth working. The blue blob inside him was bouncing from side to side, slowing him down, but he was still too fast for me. Screaming as if he were the one in pain and mortal fear, he bit off my right foot, then my left leg to the kneecap. With less of me to move, I sped up, but my mind was blurring and not just from agony. Without a miracle, I was a dead man.

Terror is one hell of a search engine. Almost in the instant that I realized my prognosis was terminal, the fingers of panic sorted through my life and snatched out the one experience that offered a shred of hope: the slowed-down reality at Myke's bar. Wally, I was sure, had pulled that stunt upon noticing that our mutual body was endangered, and if *he* could do it....

With the new "muscle" I'd discovered in e-heaven, I clutched the fabric of subjective time and stretched it outrageously. I put everything I had left into this and felt a strange kind of tearing. The center could not—

Hold everything! I blinked and looked around, slowly realizing that I was in the lab, sitting up, my back against a wall—how symbolic, I thought. The heavy table I'd been lying on was flipped on its side. My clothes were sweat-soaked and my tongue tasted and felt like an old rusty pipe. My muscles, still sore from the bar fight, were heavy bags of bruises.

I patted my left leg affectionately with my left hand; nice to be back in one piece. Potts was peering at me with a mix of horror and loathing. The horror got top billing. Thena had her poker face on, but I couldn't miss the concern in her eyes.

"How long was I gone?" I asked her.

"Two minutes or less. You groaned twice, then your muscles froze up and started quivering. I assumed you were having a seizure so I started running to you. Next thing I knew, you were halfway across the room asking how long you were gone."

"Really?" Had I learned to Speedy Gonzalez for myself, or was Wally's presence involved? "I've got plenty to tell you, Thena, but later. Potts, I'm going to get undressed now and you're going to pull Wally Jones right out of my head." Don't jar nitroglycerine, I warned myself. Keep this . . . creature just scared enough. "If you try anything cute such as trapping me in e-heaven, I hate to imagine what my partner would do to you. I've lost track of her black-belts and she knows three come-alongs that have made grown men weep."

Potts studied Thena with all the valor of a mouse studying a snake. Even so, maybe he really was an "academic" because he couldn't resist correcting me. "The person who is . . . visiting you will no longer be using the name 'Wally Jones.'"

"Right. Now, I bet, he'll be calling himself 'James Carlton.' You people are good at taking on protective coloration, aren't you?"

"Safety comes first."

To eliminate my rent-free boarder, I had to reenter e-heaven myself, but this time the visit felt brief. "So long, cobber," I called out to the red pyramid as it scuttled away from me. "No vacancies here." The pyramid disappeared behind a trefoil-like symbol representing a cooling fan. My other pals, the green ball and infinity sign, were nowhere to be seen, which was fine with me.

My brief mental contact with Wally had provided quite the education. One particularly ironic lesson: during my prior stay, I'd only encountered one genuine human upload: the weird shape my former playmates had identified as Potts's trapped ghost. Then they, or perhaps Potts, had thrown me back into normal reality before I could wise up or realize that Wally had used the "ghost" as a distraction to sneak up on me. Lord, how I'd been played! And, of course, not

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just by Potts and his pet viruses.

This round, the transition to the outer world was smooth. You're learning, I flattered myself while dressing. Now you're only half thumbs.

"Thena, might you have paper and a pencil in that warehouse you call a purse?"

"Always." Shuffle, rattle. "Will this do?"

"Perfect, thanks. Potts, this party feels incomplete. I'm going to ask you nicely to invite our two missing members, Dr. Fisk and Professor Grahame, to share the fun. I'll write out exactly what you should say."

As he watched me scribble, he made a choking noise and spat forth an accusation. "You're left-handed."

"Southpaw from birth," I admitted. "What of it?"

"Son of a bitch. I never thought to check." Somehow it didn't seem right for an alien to say "son of a bitch."

When the inference sunk in, I might've laughed if the call hadn't been so close. "How about that. You, um, installed Wally in the wrong part of my brain! No wonder he couldn't find my personal house key! It comforts me to know that advanced ETs can make mistakes that dumb."

No response.

I made myself grin, but couldn't suppress a shudder. "Okay, Potts. Read this as written. And when everyone gets here, I've got an unpleasant surprise for you."

He took the message from me but didn't beg for his unpleasant surprise.

"What the hell is this?" he asked, staring at the note.

"A Zen koan. Almost as famous as *what is the sound of one hand dialing?* Get cracking! Thena, I don't want Potts to get lonely so I'll stay while he makes his phone call. Meanwhile, how about scouting up a place for a group meeting?"

"No problem. Anything else I can do to be useful?" she smiled. "This has become your show and I'm curious to see how it ends."

"Me too. I'm going to need our laptop set up wherever we meet. Assuming you can find it in your purse."

We all sat around a big table in the largest office: Thena, Grahame, Fisk, Potts, and yours still truly. The clients and Potts, of course, had been working as a team all along. I revealed this to my partner and then went on to other crucial points. I wanted her caught up but I had a more important motive....

"J. Potts and our so-called clients are sure-enough from another planet, Thena. We were hired for an indirect purpose, kind of a bank shot: so that an alien could take over my body and sucker my uncle Hugo into becoming a similar victim."

"How interesting. Why Hugo?"

"These aliens are—well, 'fearful' doesn't do them justice. Pathologically insecure comes closer. Controlling Hugo would give them control over the local police department and thus more protection. You heard Potts earlier: 'Safety comes first.'"

"Why are they so insecure? And how did they get to Earth? Flying saucers?" No information, however bizarre, could throw this woman!

I shook my head admiringly. "Nature played a cruel game with this species: they're incredibly responsive to pain yet they evolved on a planet that makes ours seem downright cushy." Potts and company shifted nervously. "Guess what, folks. I've seen one of your cities through Wally's memories. Will your walls ever be tall enough to suit you?"

Getting no answer, I tackled the transportation issue. "Thena, I can't imagine these heroes subjecting their tender skins to the hazards of space travel. Besides, interstellar trips take too long. Speed of light and all. But to satisfy their security needs, they wanted to explore. So they got creative and figured out how to collapse energy and matter at point A and make it inflate at some dis-

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tant point B."

"That's how they travel?"

"Not exactly. Nothing living can survive being collapsed. Not that they'd dare come here physically, not with dangers such as . . . baby chickens running around loose."

She regarded me quizzically, probably wondering if I knew what I was doing. I was wondering that myself.

"Then how did we get invaded?" she asked.

For the first time since he'd sat at the table, Fisk spoke. "We're not invaders. We're just doing some useful research."

I shrugged. "By your lights, that's true. You're checking to see if we might pose a threat to your kind. That's what you *think* you're doing."

Fisk frowned at me. Amazing, the way these beings absorbed everything from language to mannerisms from their hosts. "That's what we are doing," he insisted. Grahame and Potts nodded agreement.

"I'll get back to you on that. Thena, our visitors migrate through uploading. It's a labor of fear." I was going into this right now mostly because I needed to impress Fisk and company with the depth of my knowledge. Unfortunately, that was going to require a bit of luck and a lot of bluff; I'd only gotten a hazy idea of the transfer procedure from Wally. But the potential gain seemed worth the risk. I'd made a wild guess that just might clear up this entire mess, but it wouldn't work unless the aliens took me seriously. Sweat was trickling down my sides, yet I felt cold.

I asked Thena to play along by giving her a special smile and tried to emulate someone deliberately oversimplifying ideas rather than someone who didn't know what the hell they were talking about. "First step is basic research, which our aliens do with small detectors they pop into the vicinity of a star system. If the detectors, using the collapsing-reassembling energy trick, signal back that they've found a likely planet, the aliens make an army of machines the size of dust motes. They coat each mote with—we'll call it 'electro-temporal' energy, which at least will give it some cute initials."

I paused for a moment, but no one spoke. "They put the motes into a fancy accelerator to vaguely match the motions of the destination planet. Then they open a gateway near the planet and let the micro-machines rip through its atmosphere, insulated by the ET energy. When the dust settles, enough machines will have landed to network and start testing for . . . um, electromagnetic motifs such as modulated microwaves—"

Thena nodded. "Technology implies intelligent life."

"I'd think so. The network uses the collapsing energy business to give the kids at home the good news, if any. The kids then send out a huge batch of another kind of micro-toy. These are designed to float near ground level until some lucky soul absorbs or inhales them. A hit or miss system. The secondary machines are more sensitive than their predecessors, but they only work at close range. Guess what they look for."

Thena was still listening to me, but keeping her eyes on everyone else. "Certain brainwave patterns?"

"And yours obviously fit the bill! Naturally, the machines can only infer intelligence in species with brains similar to those of their makers. Once they figure they've gotten inside something smart, the little rascals phone home. Then the real fun begins. Using their mini-tattletales as beacons, the aliens poke uploaded personalities stored as organized energy through their shortcuts in spacetime. Now class, can anyone tell me where they pop out? Here's a hint: once they arrive, they've got a new problem."

My partner rubbed her nose; the first time I remember her doing that, we were in kindergarten.

"Once they've . . . infected someone,

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Jimmy, how do they bail out?"

I applauded silently. "You get an 'A plus.' It takes years for the initial uploads to learn enough about their hosts to take control, and when they do, they *become* their victims in part. Then, unless the local civilization is truly advanced, they have no way to leave their new bodies, let alone go home. It's one thing to drop simple messages down a cosmic pneumatic-tube, quite another to transport an entire uploaded person."

"So they're stuck?"

"Rarely, it happens, which is why only the bravest of these cowards get drafted for this job; by their standards, Potts is a daredevil. But our aliens are brilliant at recreating their own equipment no matter where they wind up. And remember, they've already hedged their bets by only going to planets with high technology."

Thena's eyes stayed focused on their three targets, but they narrowed. "Are you saying that Live Forever—"

"Right again! The human race isn't knowledgeable enough yet to make such sophisticated machines, which is why Live Forever has no competition. Hell of a trade secret."

Grahame rapped on the table for attention. "Mr. Carlton, we have waited patiently long enough. Our plan concerning you has failed, we acknowledge that. You are unexpectedly perceptive."

"Well, you shouldn't have hired . . ." I almost said "Sherlock Homo sapiens," but didn't want Thena to know that I was dancing that close to the edge, ". . . a detective."

Potts added nothing I didn't already know. "You were just lucky," he said.

"My question, young man," Grahame resumed, "is simple: what now? Do you intend to turn us over to your authorities? Do you imagine anyone will believe your story? I see no reason why we shouldn't all leave this room now and be about our business."

I nodded. "I do. I happen to have a solution to our little problem."

"Frankly, I doubt it."

Unlike Potts, neither she nor Fisk seemed at all intimidated by Thena or me. Not surprising, considering what I'd learned about these two from Wally. "Will you permit me a small demonstration?"

"The doctor and I are busy."

"I'll be brief. You'll have noticed the laptop computer sitting near us. Can you all see the screen? I'll just press the space bar to clear the screensaver. There we go."

I'd already set up two simple graphics. One was a large red circle with a small blue circle inside. The second was identical, except that I'd selected paint-mode and made the colors additive, so the small circle appeared purple.

"Professor, if I may still call you that, please describe what you see."

Perhaps curiosity is universal. At least, she didn't balk. "There's a red ball with a blue hole in it and another one that's entirely red."

"I thought you'd see it that way."

"Are you disputing my statement?"

"Let me explain. When I was borrowing Wally's memories, I could *see* heat. But while I sensed that Wally was seeing it as a color or various colors, I could only perceive it as texture. It's a matter of brain development, I suppose. Obviously, you people see infrared frequencies that humans can't."

Fisk looked annoyed. "We knew that already. What's your point?"

"Ever try colored sunglasses? Through Wally's eyes, your world seemed tinted orange. At first I figured your sun is probably redder than ours. Later, I realized that humans see further than you into the short wavelengths. Your current eyes are human but your conditioning still holds. You don't see the color blue, not the way we do. What you call 'blue' is probably a variant of gray and it's more or less invisible for you when mixed with other colors."

Fisk's expression had turned thoughtful. "Interesting, if true. However, the rel-

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evance still—"

"Listen carefully. When Potts put me into e-heaven, I got a close look at several of your colleagues. I pictured them as assorted forms and colors, but they all had one feature in common: small blue shapes that floated freely inside them."

I had everyone's, even Thena's, total attention now. "I didn't think anything of it," I continued, "until I scared Wally to the point where he attacked me. He was faster than me and would've caught me immediately, except the blue blob inside his body kept throwing itself around, opposing his movements."

"How do you interpret this?" Grahame whispered.

"Simple. While you've been busy haunting humans, something has been haunting you, something with its own agenda. Do you think it's a coincidence that these particular passengers are blue?"

Three pairs of eyes stared at me in horror, Thena's being the exceptions. I waited for comments, but no one said a word.

"It seems that your ghosts aren't interested in dominating you the way you try to dominate us. Perhaps they're just keeping a—an eye on your kind, maybe making a suggestion now and then. Ironically, you've made it damn easy for them. I bet that long ago, they found your home world the way you found Earth, and then used your own paranoia to nudge you into building enough equipment to give them a free ride to God knows how many planets."

Dead silence.

"And now that you've got Live Forever up and running, they can pop into Earth's e-heaven whenever they want and enter one of your uploaded minds. I don't know if they could invade human minds; but *your* uploads would never see them coming. Hell, any species with the right know-how could use your equipment. Perhaps your blue amoebas have parasites of their own. Food for thought."

Fisk and Grahame, expressionless, turned to Potts. "Send a general warning, and destroy all systems and records," Grahame ordered. Potts rose and left the room.

I stared at the clients. "You've got your trans-stellar Western Union set up right here? I have to hand it to you: you're prepared. Okay, I'm opening the floor to discussion. Anyone?"

I heard several distant thuds, but no one spoke until Potts returned. "Messages received," he said quietly, sitting down again. "And both systems are gone."

I shut down the laptop and waited until the screen had rolled itself up. "We're done here," I said to Thena, handing her the computer and standing up. She shoved the thing in her purse, got to her feet, and preceded me through the door without asking a single question. I'd never admired her more.

Before I joined her in the hallway, some masochistic streak made me hesitate and glance back into the room. Fisk and Grahame were slumped, no longer breathing. Potts seemed to be deeply asleep, but I knew that he too was shutting down forever. Feeling ill, I stepped outside and softly closed the door behind me.

We were in the hotel room, having just finished the obligatory check to make sure that no prized possessions had rolled under the bed or scurried beneath used towels.

I was tucking yesterday's dirty clothes in my suitcase when Thena tugged on my arm.

"Jimmy, when you're finished playing with those gross socks, would you mind clearing up a few things?"

"Ask away."

"Once you were on to him, Potts was a nervous wreck. You claimed it was a species characteristic."

"Yes."

"So why were the clients so calm?"

"Oh. That. The answer's rather

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creepy."

She shrugged. "Aren't ghost stories supposed to be creepy?"

"'Ghost stories' is more right than you know! When I was sneaking up on Wally in my own mind, I caught him abusing my brain. He was sealing off sections, trying to shut down certain functions. Lucky for me, he was working the wrong hemisphere so it didn't affect me much."

"Lucky for me, too."

"Maybe lucky for everybody—everybody human, that is. Anyway, by the time I showed up, he'd managed to get one or two spots in my brain partly isolated, isolated enough so that I could guess what would happen if they were completely cut off."

"What?"

"Over time, those areas would shrink to nothing from poor blood supply. When I turned the tables and invaded Wally, I learned some things about Fisk and Grahame. Unlike Potts, their controlling entities had been in place for a *long* time. The original personalities were long gone and the sealed-off parts of their brains had disintegrated. You can't upload a personality from a half-rotted brain, so Fisk and Grahame were trapped."

"But still functioning?"

"None too well. They'd had to take conscious control of some autonomic functions and their metabolisms had slowed to a crawl. Just keeping their bodies warm enough took constant attention."

"They were dying."

"Exactly. They just didn't have enough hormones left to be scared. Well, their problems are over now and so are ours."

She rubbed her nose. "In the cab, you said they'd killed themselves."

"A species that cautious wouldn't send out spies who couldn't commit quick suicide. I imagine that *all* their agents, here and on every planet they've infested, are dead by now and they won't be sending out any more. And I'll bet the home world is conducting the ultimate antivirus ... pogrom."

"Are *you* all right?"

No. "A little down. I'll recover."

"You're positive that the aliens were only checking on us to see if we were a potential threat?"

"I'm positive."

"What would they have done if they decided we were trouble?"

I spun around and found I had to put some real weight on the suitcase to close it. "Why do clothes always expand in hotels?"

"Jimmy!"

I turned back to Thena. "Okay. They'd already made that call. In their book, we're big trouble. Usually they try to destroy worrisome worlds."

"*Destroy?*"

"Yeah. Finesse enough matter directly into a planetary core and WHAM."

"That easy?"

"Even easier when you factor in relative motions. Their matter would show up here moving damn fast. This time, they opted to try something subtle. Most of our visitors, such as the one running Grahame, were ... esthetes, typical of the species. These artistes found Earth pretty enough to be worth colonizing; if, that is, they got rid of us and ever developed a truly safe way to get here. So to preserve the real estate, they calculated our psychology and came up with a slow method of genocide. If it didn't work, they could always revert to the wrecking ball."

"What'd they have in mind?"

"Decades ago, they started a bunch of loose talk about an upcoming singularity and were about to launch a huge publicity campaign to convince everyone that uploading is a jolly good idea and e-heaven is the only safe place to be."

"Oh." She searched my eyes. "Funny, you sounded a bit Australian there for a second."

"Don't worry, I'm still me. Mostly. One thing I've learned: you become what

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eats you along with the reverse."

"What about the alien uploads at Live Forever?"

"Erased when Potts shut down the system." Along with the human minds in e-heaven. I had plenty to feel bad about.

"Thena, there's another troubling detail. We don't know thing one about the blue-blob species. I keep wondering why Wally's parasite saved my life. And I'm not assuming altruism."

I ached from my scalp to my soles. The deaths I'd caused had left me sick and shaken, and some of Wally's memories were still clogging my thoughts. On a practical note, Thena and I would never be paid for all our work. *But* how often does a small-town detective get to save the world?

"One more question, Jimmy. For now."

"Shoot."

"What was that message you gave Potts? How did you get the clients to drop whatever they were doing and rush down to Live Forever?"

"Oh, that. I just had Potts repeat my favorite Zen koan: 'Who is dragging that corpse around?' Let's go home." ■

Why is it that when a person is very good at what they do, that's taken to mean they should be doing something else?

— Kelvin Throop

People who cannot recognize a palpable absurdity are very much in the way of civilization.

— Agnes Repplier

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Fat Mice, Eating Machines, and Biochemical Treason:

Will We Ever Create a Dial-a-Weight Pill?

Richard A. Lovett, Ph.D.

In her best-selling book *Seabiscuit*, author Laura Hillenbrand tells how jockeys of the 1930s forced their bodies to the unnaturally thin weights required for horseracing. Some ate little but lettuce. Others dehydrated themselves in rubber sweat suits. One of the more exotic methods was an unusual pill. It wasn't really a medication: it was the egg of a tapeworm. But apparently it worked. When the tapeworm had done its job—robbing the infected jockey of enough nutrients that he'd become as thin as he wanted—he'd have a doctor kill off the parasite.

Practical methods of weight control haven't progressed a great deal since Seabiscuit's day. Even science fiction hasn't addressed the topic in any depth. Otherwise, most future societies would feature some form of "dial-a-weight" pill—one a lot less barbaric than a tapeworm egg.

Such a pill would put today's weight-loss industry out of business overnight. By taking just the right dose combination of medications, you could program your body to move naturally to any weight you wanted, at least within a wide range. No counting calories. No diets. Your body would simply adjust its appetite and its metabolism to store fat if you're underweight or to burn off the excess if you're not. For many of us, it sounds like heaven. And nutrition researchers are finally beginning to get a handle on how to make it happen.

Biochemical Treason

Most discussions of weight control pit behaviorists against biochemists. The behaviorists (themselves usually thin) preach that if you're fat, the solution is simple: all you have to do is eat less and exercise more. In theory, of course, they're right. Years ago, I was a super-thin marathoner and ultra-distance triathlete. At 5'6", I considered myself overweight if I tipped the scales above 132 pounds. But even with the heavy training it takes to race well in a triathlon, I had to struggle to keep my

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weight from creeping upward. When an injury sidelined me for six months, my weight jumped fifteen pounds. After the injury healed but I failed to return to racing, my weight continued to climb by about four pounds per year—even though I did a great deal of backpacking and long-distance bicycling. Eventually, I found myself at 191 pounds, bordering on clinical obesity.

This experience convinced me that the behaviorists are only partially correct. For a few people, weight gain does indeed result from repeated indulgence. But the type of weight creep most people experience is more subtle. Consider the following:

- In the 1990s and early 2000s, the average American gained about two pounds per year.[1] Two pounds isn't much, but if it is repeated every year for a couple of decades it adds up to the forty or fifty pounds many people gain in middle age.
- Two pounds of fat is 7,000 calories.
- Seven thousand calories per year is slightly less than twenty calories per day.
- Twenty calories is about four Lifesaver candies, six Jelly Bellies, one carrot, or one-fifth of a large apple.
- Walking burns off approximately 100 calories per mile. Walking only four minutes "too little" per day is another way to gain two pounds per year.
- The average person eats 28,000 pounds of food during a lifetime (dry weight).[2] If you gain fifty pounds during adulthood, you've only managed to store one-sixth of 1% of that food as fat.

The point is that except for a few people,[3] weight creep results not from bingeing but from very, very tiny imbalances between food intake and energy expenditure, repeated day after day, year after year. Nobody would accuse you of bingeing if you ate even a whole apple per day of "extra" food; but by the standards of what we've been discussing, that's a huge imbalance—enough for you to gain a whopping ten pounds per year. A mere twenty-calorie-per-day imbalance represents a degree of overeating so tiny it would be imperceptible even to nutritionists.

Our bodies are designed to balance calorie intake and expenditure not by willpower or calorie-counting, but via feedback mechanisms that regulate appetite, exercise, and metabolic rate to preclude undesirable gains or losses. Weight creep results not from bingeing, but from biochemical treason—when something defeats these feedback mechanisms and causes the body's preferred weight to inch upward.

There are at two ways to overcome this. One is the approach I used: go on a weight-loss diet, supplemented by vigorous exercise. (I eventually went back to running marathons). That's the old-fashioned way, and it works because while we can't fine-tune our eating and exercise well enough to avoid that twenty-calorie-per-day weight creep, we can starve off the pounds by temporarily throwing our bodies far out of balance. But it's hard, time consuming, not a lot of fun, and generally requires constant monitoring to be successful. Also, as soon as they attempt to return to normal life, most people's weight starts to creep back up, all over again.[4]

The future will deal with weight control the way we now deal with other

[1] James O. Hill, Holly R. Wyatt, George W. Reed, and John C. Peters, "Obesity and the Environment: Where Do We Go from Here?" *Science*, 7 February 2003, 853-855.

[2] Jeffrey Friedman, "Leptin and the Biological Basis of Obesity, 169th Annual Meeting of the American Association for the Advancement of Science, 13-18 February 2003, Denver, Colorado, presentation at symposium *Obesity: Molecular Causes and New Pathways for Treatment and Prevention.*

[3] I've had friends who are "depression eaters" who can gain twenty or thirty pounds per month when life is not going well.

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metabolic ailments such as diabetes or low thyroid: by figuring out what your body needs and administering it daily, like insulin or thyroid hormone, in carefully regulated doses—no guilt, no social stigma. In fact, it's likely that the majority of people will be on some form of weight-control medication, simply to stave off weight creep.

In the 1990s, many nutrition researchers thought they'd crack this problem and start producing such medications by the turn of the century. In 2003, British researcher Stephen Bloom told a reporter for *Science* that another decade of intensive research will produce a functioning weight-control pill.[5] Maybe yes; maybe no. But the research does offer increasingly promising lines of attack.

One approach begins by trying to figure out why some people experience weight creep—and some don't.

Primordial Eating Machines

In the early 1990s, Barbara Rolls, a nutrition researcher at Pennsylvania State University played a nasty trick on her research subjects. Having extracted promises from them not to eat outside the confines of her laboratory (where everything could be measured) she surreptitiously tinkered with their meals, trying to see what happened if she sneaked extra calories into their diets. In one experiment, she fed them yogurt snacks thirty minutes before lunch, made from recipes that were indistinguishable by taste but varied from 160 to 360 calories per serving.

Many of her subjects—primarily those who were trying to watch their weight—ate the same-sized lunches regardless of which type of snack they received. Calorie counters were particularly prone to this error. Rolls posited that they tried to guess how many calories were in the yogurt and then decided what to eat for lunch. Since they couldn't taste the difference, they made the same guesses for the high- and low-calorie snacks.[6]

But a few of her subjects, mostly normal-weight, "non-diet-obsessed" young men who generally ate whatever they wanted, refused to be fooled, eating almost exactly 200 fewer calories after receiving the high-calorie yogurt than they did after receiving the low-calorie version. When she presented her results at a scientific conference,[7] Rolls referred to this second group as "primordial eating machines." If scientists could figure out why these people's bodies regulated

[4] In my case, it took nine months to drop my weight back into the 130s, and it still doesn't want to stay there. In the subsequent four years, I've had to re-lose the same two or three pounds so many times that I've probably lost nearly as much weight that way as on the initial diet. Depressing studies of people who've lost substantial amounts of weight indicate that the body's tendency to attempt to regain the loss persists for at least five years. The most depressing part of these findings lies in that little phrase "at least." The early leading study was terminated after five years—which means that nobody knows whether the body ever adjusts to the lower weight. On the other hand, findings from the National Weight Control Registry (see below) indicate that the longer one maintains a weight loss, the less difficult it is to maintain the loss (in terms of perceived psychological effort). See *www.lifespan.org*, postings from National Weight Control Registry.

[5] Tisha Gura,, "Obesity Drug Pipeline Not So Fat," *Science*, 7 February 2003, 849-852.

[6] A behaviorist might argue that these people were out of touch with their bodies and were eating without paying attention to whether or not they were hungry. A biochemist would argue that they were counting calories in the first place because they knew their bodies weren't giving them the proper satiety signals. That made them the easiest to fool.

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food intake so well, it would greatly assist in finding out why other people's don't.

Rolls' research provides food for thought for genetic anthropologists. It has often been argued that modern humans are descended from hunter-gatherers adapted to feast-or-famine environments. Our ancestors, this theory posits, never got enough food to become seriously obese, so they were adapted to store fat whenever food was in ample supply. After all, if starvation is a risk, each pound of fat translates into an extra two to three days' survival time. Today these genes work against us, encouraging us to slowly pack away extra calories in anticipation of a famine that never arrives.[8]

But the hunter-gatherer theory doesn't explain Rolls' "primordial eating machines"—the 30%[9] or so of the U.S. population who, without conscious effort, manage never to gain weight.

Jeffrey Friedman of Rockefeller University argues that these primordial eating machines aren't actually all that "primordial." Rather than being throwbacks to hunter-gatherer cultures like the rest of us, he suggests, they're the people whose genes have been most successfully domesticated by generations of farming.[10]

Farmers have no reason to pack on weight during times of plenty. In fact, doing so is counterproductive. It's more efficient to store food in barns until you need it than to carry extra body fat around with you from one harvest to the next. In the 8,000 to 10,000 years since it was invented in the Fertile Crescent of the Middle East,[11] farming would favor people who didn't tend to gain weight—people whose descendents seem blessedly immune to the temptations of today's calorie-rich environment.

For proof, Friedman cites two seemingly disparate groups: Pima Indians and Pacific Islanders. These two cultures are separated not only by an ocean but by thousands of years of human migration, but both were hunter-gatherers until very recently. Both have fared very poorly when introduced to the modern Western diet. Even more interestingly, one small group of Pacific Islanders studied by Friedman appear to be comprised of two subgroups: those who easily become obese, and those who don't.

Western explorers first visited these particular islands in 1845, but it wasn't until a century later, near the end of World War II, that the Western diet was introduced. Before then, the island's native Micronesians mixed with a small number of Caucasian immigrants but preserved their native diet. Now, after three generations of exposure to the Western diet, most but not all are clinically obese. Friedman posits that the obese ones will prove to have weight-control genes derived predominantly from Micronesian hunter-gatherers. Those who resist obesity will prove to have a stronger dose of the "Fertile Crescent" or Western farming genes. The result, he predicts, will be a fruitful arena for studying the relationship between genetics and susceptibility to obesity.

* * *

[7] Federation of American Societies for Experimental Biology (FASEB), April 24-28, 1994, Anaheim, Calif., *See* "Effects of Olestra, Aspartame on Eating Patterns Examined," *Food Chemical News*, 30 May 1994, 16-19.

[8] Other researchers have noticed that most people's bodies are better at avoiding becoming too thin than at not becoming too heavy. See Jean Marx, "Cellular Warriors at the Battle of the Bulge," *Science*, 7 February 2003, 846-849.

[9] Eleftheria Maratos-Flier, "Fat and Fate: Neuronal Circuitry of Energy Balance," 2003 AAAS Annual Meeting, obesity symposium.

[10] Friedman, 2003 AAAS obesity symposium; and Jeffrey M. Friedman, "A War on Obesity, Not the Obese," *Science*, 7 February 2003, 856-858.

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False Alarm

Some of these genetic differences will probably involve a hormone called leptin, which is produced by fat cells. One of leptin's roles is to tell a portion of the brain called the hypothalamus how much fat the body has. Lots of leptin means lots of fat. Appetite shuts down and metabolism speeds up as the body seeks to burn off the excess. Low leptin means little fat, and the body goes into conservation mode: cutting back its base metabolic rate, stimulating appetite, and inducing food-search behavior.

Leptin can be friend or foe, depending on whether the body is producing the ideal amount of it. After actor Robert De Niro put on fifty pounds for his role as a boxer in the movie *Raging Bull*, leptin would have helped him return to his normal weight. When he was carrying the extra pounds, his body would have been producing excess leptin, and his hypothalamus would have wanted to shed the extra fat. Even overweight people can see this force in action: it's why, even if you're gaining weight, it generally creeps rather than gallops. During my own overweight period there was always a weight above which my body didn't want to go, regardless of what I ate.[12] But if I dropped more than a few pounds below that point, I'd be perpetually seeking snacks. My hypothalamus thought I was starving, even though, objectively speaking, I was far from it.

Food-search urges can be extremely powerful. Several years ago, John Brunzell of the University of Washington told an American Heart Association gathering about a naturally obese friend who kept thin via exercise. After a jog, Brunzell's friend would window shop on the way back to the office. "It was fascinating," Brunzell said. "First, he would look in a pastry store, then a butcher shop. Then he'd look at display of paper plates and napkins. He reacted to every stimulus related to food."[13]

That's the power of low leptin in action. For people who've successfully used willpower to override the urges of naturally obese bodies, food (including the effort to stay away from it) is a central focus of their lives. Often, they engage in obsessive-compulsive behaviors that would be considered neurotic in other circumstances. There are even reports of such people going to counselors every year or so, seeking to instill a new "neurosis" because an old one is no longer working and their weight is starting to creep. The bottom line: even a lot of healthy-weight people might benefit from a dial-a-weight pill that allows them to maintain their present weights without so much effort.

When Friedman's research team discovered leptin in 1994, it was hoped that it would be the key ingredient in just such a pill. And there are cases where it clearly works. One involved a child we'll call Baby X.[14] The child was normal-weight at birth, but before age four he had become morbidly obese, tipping the scales at ninety pounds and measuring 57% body fat. (Adults are considered obese at 30% body fat). The child proved to have a rare genetic disorder that interfered with the production of leptin. Because of the defect, he was consuming a staggering 1,125 calories in a typical meal. When doctors started administering leptin, his food

[11] The Fertile Crescent is an arc of well-watered land running from Iran and Iraq to Israel and Egypt.

[12] The weight creep problem is that this "natural" weight seems to slowly ratchet upward.

[13] American Heart Association, Science Writer's Forum, Monterey, Calif., January 15-17, 1993.

[14] See J. Marx, *supra*. Additional details come from Friedman's 2003 AAAS presentation. The name Baby X is my creation.

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consumption dropped to 180 calories per meal. Within a year his weight dropped to seventy-two pounds, and in a picture taken at age 8, he looks positively slim.

That's the dream model for our dial-a-weight pill. Unfortunately, leptin alone doesn't appear to do the trick for most people. It works for rare people like Baby X, and it might assist 5 or 10% of the population who may be partially leptin deficient. But for everyone else, it appears to be very hit-and-miss.[15] Most overweight people, sadly, are "leptin resistant"—which means that their leptin mechanisms aren't very good at halting weight gain, even if they're given extra leptin as a supplement.

Knocking Out Mouse Genes

To study hormones in greater detail, biochemists often use genetically engineered mice called *knockouts*. These are organisms in which selected genes have been disabled so that instead of producing their usual proteins, they do nothing. It's an extremely powerful tool: by studying knockouts, we find out a great deal about the normal role of the disabled hormone (or enzyme).

Because mice, like people, have leptin, an obvious experiment is to create a leptin-knockout mouse. With no leptin feedback mechanism to tell their hypothalamuses how much body fat they have, these mice are huge. They're also quite inert. One researcher calls them the ultimate couch potatoes of the rodent world.[16] Not that this is surprising. Baby X told us the same thing regarding people: if your fat cells don't produce leptin, your hypothalamus thinks your body has no fat and sets out to fatten you up. But we can also use knockout mice to look at other hormones that might have an impact on diet.

Two potential targets are ghrelin, an appetite stimulant, and PYY, a suppressant. Ghrelin was discovered in 1999 by Japanese researchers, although it wasn't until 2000 that they recognized its role in appetite. It is produced by the stomach and appears to be the stomach's way of telling the brain that it's empty and, by golly, it's time to eat. Drug companies are scrambling to find a drug that will inhibit ghrelin production. But even if they find one, they need to know whether shutting down short-term hunger will contribute to long-run weight control—an open question, because it's possible that some other hormone would take command, and you'd wind up eating the same amount, anyway. One way of finding the answer is by making ghrelin-knockout mice. I've not heard of anyone doing this yet, but that doesn't mean it's not being done.[17] It's an obvious step: if these mice aren't thin, a ghrelin-suppressant probably won't be of much use for human weight control.

PYY is an even more recently discovered hormone. Ghrelin turns appetite *on*; PYY shuts it off in rats, mice, and human volunteers.[18] Here, the target drug would presumably be PYY itself (or some chemical analog). That means there's less need to find out what happens when natural production is shut off, but PYY-knockout mice would still reveal much about how PYY does its job, and I'd be surprised if someone isn't already working with them.

One other hormone that *has* been studied via knockout mice is melanin concentrating hormone (MCH). It's produced in the brains of animals that

[15] S. Heymsfield at al, *Journal of the American Medical Association*, Vol. 282, p. 1568 (1999).

[16] E. Maratos-Flier, *supra*.

[17] Because of the high financial stakes, much of the research into weight-control drugs is secret. An internet search for ghrelin, however, does produce numerous hits.

[18] Stephen Bloom et al, *Nature*, 8 August 2002. See also T. Gura, *ibid.*

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haven't eaten for a while, and appears to be a powerful appetite stimulant.

This means that if we knock out the MCH gene, we should get mice that are picky eaters. But that's not quite what happens. When Eleftheria Maratos-Flier of Joslin Diabetes Center at Harvard Medical School engineered a strain of MCH-knockout mice, she found that they indeed were thin, but that they ate as much food as their MCH-producing cousins, especially when given tasty, high-calorie diets.[19] This means that the MCH-knockout mice are somehow burning off calories that normal mice would store as fat. One way this might happen is if they are getting more exercise. To test this, Maratos-Flier criss-crossed the mouse cages with infrared beams and used an electronic counter to tally the number of times the animals broke the beams.

The results were intriguing. On normal diets, the MCH-knockouts weren't any more active than the control animals. But when they were given high-calorie meals, they became comparatively hyperactive. This means the role of MCH is a bit broader than was initially suspected. In addition to boosting appetite, high levels of MCH cause mice to conserve energy by becoming sedentary—useful if you're a mouse that's just eaten a high-fat meal and doesn't need to go find another for a few hours. Without MCH, the mice not only aren't as hungry unless you tempt them with tasty snacks, but they fidget away extra calories by prowling their cages. If the hormone works the same way in humans, then a drug pill designed to inhibit it might help sedentary people find the motivation to become more active—two health benefits for the price of one!

Other weight-control hormones also produce multiple effects. Consider melanocortin, a hormone that suppresses appetite by activating cellular sites called melanocortin receptors (MCRs). Drugs that stimulate the same receptors should also suppress appetite—and they apparently do except for one minor problem: there are at least four known MCRs (called, simply enough, MCR-1, MCR-2, etc.), and they do different things. MCR-1, for example, induces production of the skin pigment melanin.

A few years ago, a research team at the University of Arizona wondered whether it might be possible to develop an MCR-stimulating tanning drug—useful for protecting people from the desert sun. But when they got their candidate drug into clinical trials, their male test subjects experienced unexpected erections. To their amazement, the researchers realized they had Viagra, a tanning booth, and a weight-control pill all rolled into one. Unfortunately, the pill has major problems for tanning and appetite-control because the Viagra effects occur at the lowest doses.[20]

3.5 Acres of Energy

Appetite suppression is only half of the weight-control equation. Energy expenditure is the other. We've already seen that MCH-knockout mice burn off high-fat meals by running around their cages. But mice have another way to burn off calories: they can turn them into heat via the mitochondria of a special type of fat, called brown fat.

Mitochondria are subcellular powerhouses that use oxygen to provide energy for our muscles and many other bodily functions. Under a microscope, they look like dark grains of sand, sprinkled through the protoplasm. Chemically, they function like batteries that pump

[19] E. Maratos-Flier, *supra*. Mice, like people, will eat for pleasure. They particularly like marshmallow- or piña colada -flavored mouse pellets, high-fat snacks, and almond-flavored sugar cubes.

[20] Trisha Gura, "Having it All," *Science*, 7 February 2003, 850. The drug, called PT141, may have market potential as an alternative to Viagra.

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charged particles across an inner membrane where the energy is captured by converting a molecule called adenosine diphosphate (ADP) into a higher-energy form called adenosine triphosphate (ATP). The human body has so many mitochondria that they use 100 gallons of oxygen per day, and—by recycling ATP and ADP over and over—produce 140 pounds of ATP per day. Unfolded, the membranes along which the energy-producing reactions occur would have a total surface area of 3.5 acres.[21]

Brown fat is brown because it is rich in mitochondria. Mice (whose small body size makes them prone to hypothermia) use this fat to generate heat in cold weather. How much energy they burn off this way depends on temperature and on whether the mice are well fed or starving. Leptin-knockout mice (whose bodies are fooled by the absence of leptin into thinking they're dangerously thin) produce so little heat in their brown fat that they die easily of hypothermia, even though their fat reserves are more than ample.

The mitochondria in brown fat contain a protein called uncoupling protein, which short-circuits the mitochondrial battery, releasing the battery's energy as heat before ATP can capture it. It's possible to create genetic knockouts that disable the uncoupling protein and the chemicals that signal its action. The biochemistry has proven to be unexpectedly complex, but puzzling out its intricacies is important because revving up brown-fat metabolism is a mechanism mice use to burn off excess calories, even when they don't need to keep warm.

The relevance of these studies to humans is open to question because people don't have brown fat. But we do burn off calories as metabolic heat, and the biochemistry might be similar to that used by mice. One study[22] overfed people by 1,000 calories per day for twelve weeks, then gave them CAT scans to determine precisely how much body fat they gained. The researchers found that some people gained twenty times as much fat as did others—indicating that there are huge variations in how people's bodies handle excess calories. Even if people don't have brown fat, will the mouse studies reveal a way to dial up our own metabolisms to burn off excess calories? Nobody knows. And what would happen if someone taking such a metabolism-regulating pill binges big-time? Would the excess heat cook the mitochondria or the cells that contain them? *That* would be an interesting topic for a science fiction story!

2,000 Steps

So far, we've looked at weight control from an individual standpoint: attempting to identify factors that cause some people to gain weight while others don't. But obesity also has a social dimension. Not only do many individual people gain weight as they move through life, but our culture is doing the same. Depressing statistics are easy to find:

- The 1999-20000 National Health and Nutrition Examination Survey (NHANES) showed that 65% of the U.S. population is now overweight, compared to 56% in the prior NHANES study, conducted between 1988 and 1994.[23]
- Approximately 300,000 Americans die of obesity-related diseases every year.[24]
- Such diseases account for 5.5 to 7.8% of total U.S. health care expenditures and rob the economy of nearly 40 million work days per year.[25]

[21] Bradford B. Lowell, "Regulation of Energy Expenditure: Insights from Genetically Engineered Mice," 2003 AAAS Annual Meeting, obesity symposium.
[22] C. Bouchard et all, New England Journal of Medicine (1990).
[23] See www.cdc.gov/nchs/products/pubs/pubd/hestats/obese/obse99.htm.

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• An emerging epidemic of diabetes could be halted if obesity could be arrested.

The key question is: why are Americans (and many other cultures) becoming increasingly heavy? Potential culprits abound. One, says James Hill, director of the Center for Human Nutrition at the University of Colorado Health Sciences Center, is super-sizing. "For an extra thirty-nine cents, you can get twice as many calories as you need," he quips. "Nobody can pass up that kind of deal."[26]

Others blame high-fat diets. But actually, U.S. fat consumption has been declining. Recreational exercise has also been moving in a healthy direction. "More people than ever before are selecting exercise as a leisure activity," says Christine Bruhn, director of the Center for Consumer Research at the University of California, Davis.[27] In 1976, for example, 25,000 Americans ran marathons. By 1990, the number had risen to 260,000; in 2000 it exceeded 450,000.[28]

The problem, Bruhn and Hill say, isn't lack of recreational exercise: it's increasingly sedentary forms of work. "Computers have probably contributed as much to weight gain as McDonalds," says Hill. Even forms of work that were once viewed as fairly active are no longer as demanding as they once were. In 2003, a British study found that full-time housework does not burn off anywhere nearly as many calories as it once did. The reason: easy-to-use products such as super-effective cleansers that have reduced the need for scrubbing.

Hill, whose research focuses on finding ways to add more exercise to our lives, is also disturbed by the replacement of old-style city blocks with spaghetti bowls of you-can't-get-there-from-here cul-de-sacs. The old grid systems made it easy to walk to the corner market (if there was one). The new systems encourage driving.

Hill leaves it to other researchers to find drugs to help overweight people shed accumulated weight creep. His goal is simultaneously more modest and more far-reaching: he wants to redesign society to stave off additional creep. The key, he believes, is getting more exercise back into the workday. In a test program called Colorado on the Move,[29] he gave electronic step counters to volunteer research subjects. People in the program initially used the counters to determine their normal activity levels. Then they committed to increasing that by 2,000 steps per day—about a mile of extra walking. The extra could be done either by finding more ways to move around the office during the workday or by walking in the evenings, but the primary goal is to make people more exercise-conscious throughout the day. If it works, Hills study subjects will burn off 100 extra calories or so per day—hopefully without undoing it with extra eating.

I expect that the On the Move program will prove to be only part of the exercise answer. During my own heavy period, I noticed that moderate exercise had little effect, but that my appetite would suddenly shut off when I engaged in prolonged heavy exercise, such as a backpacking trip or a multiday bicycle tour. It was as though my body suddenly looked at what I was doing and said, *Oh my gosh, you're way too fat for this nonsense.* Today, I have less trouble

[24] Marx, *supra*.
[25] J. O. Hill et al, *Science*, *supra*.
[26] James O. Hill, "The Challenge of Maintaining a Healthy Weight in an Unhealthy Environment," 2003 AAAS meeting, obesity symposium.
[27] Telephone conversation, August 6, 2003.
[28] USA Track & Field, Road Running Information Center.
[29] See www.coloradoonthemove.org.

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maintaining my weight when I'm training for competitive racing than when I'm merely jogging, and I suspect that something in the weight-and-diet-control centers of my brain is more easily reprogrammed by intense exercise than by lower-key exercise.

Hill tentatively agrees. He has no data directly on point, but he's compiled a cohort of people who've lost weight and held it off, trying to see what these "successful losers" have in common.[30] In early 2003, I discussed my experience with him, and he told me that he's heard similar stories form other people in his cohort. Most likely, there's biochemical magic in intense exercise, but nobody's yet figured out the details.

The only science fiction story I've seen tackle these issues was published in the early 1980s. It posited a health-obsessed future in which everyone had to run a prescribed number of miles per week, logging their progress on scanners. Healthy eating had also become mandatory, and sugar had become a controlled substance.[31]

Such a future makes a cute story, but is a bit dated. Rather than being forced to exercise by a repressive government, people are more likely to find themselves under financial pressure from health insurance companies, which might set rates based on weight, exercise level, and diet. To verify that you're not lying about one of these, your insurance company might require your bathroom scales to report your weight to the company's website, and you might be required to carry one of Hill's electronic step-counters (complete with it's own upload feature). Similarly, you might have to test your meals with a tiny, electronic probe that informs your insurance company of their fat, calorie, and vitamin content.

Another issue that's ripe for fictional exploration is the cultural impact of a dial-a-weight pill on anorexics. Would ready availability of such a drug turn millions of people into anorexics? One could certainly imagine a future in which weight-control hormones become black-market drugs (or gray-market substances like performance-enhancing drugs currently are in athletics). In such a society, beauty pageant contestants might be subject to drug testing to make sure they're not slimming down the easy way.

But if weight-control drugs really were safe, effective, and inexpensive, that could change the way society views body weight. Part of the premium our culture places on thinness is due to the difficulty of achieving and maintaining it. If anyone could be thin simply by popping a pill, thinness would be nothing special and there might be a fashion shift toward something less extreme.

Anorexia might even decline. Classically, anorexics are people who are desperately trying to control lives that feel as though they are out of control. They fixate on weight partly because it's something they *can* control, but also because that control requires a great deal of effort. In other words, they're proving to themselves that they can exert control in the face of considerable difficulty. A world in which anyone can become anorexicly thin wouldn't alter the underlying psychology, but it might force these people to seek to apply that iron-willed control to another aspect of their lives. Whether that would be an improvement would depend on how that psychological energy got channeled. But it would certainly be an interesting arena for science-fictional exploration. ■

[30] The database is called the National Weight Control Registry and is open to anyone who's lost at least thirty pounds and held it off for a year or longer. Registration can be done online at www.lifespan.org/services/bmed/wt_loss/nwcr.

[31] I believe the story was published in 1982 or 1983, but I don't remember the author or the magazine. If anyone knows the citation, please let me know via *Analog*.

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Probability Zero

What Engineers Know

Arlan Andrews

Dr. Grandiveer Plone, renowned physicist, accepted the Nobel Prize of 2012 in his field with great humility and dignity, acknowledging his debt to his university, his research institute, his graduate students, "And a lone United States Army field engineer whom I met during the late unpleasantness in Arabia Felix." Mutters washed over the mostly Scandinavian audience; they had given Dr. Plone his award in spite of his service as a Special Ops colonel in the American military, those historic but warlike accomplishments not rising in their minds to his later achievement in theoretical physics.

Oblivious to—or perhaps enjoying—the discomfort of his hosts, Dr. Plone went on, "It was right before the restoration of the Mecca Crater that I met Doc Briggs, the compleat engineer. He was one man who could design anything, build anything, repair anything—the most accomplished human being I have ever met." Sgt. Briggs' exploits in the Mideast Wars were all too well known to the still simmering Swedes, and to the millions of unwelcome refugees who had fled the collapse of the old E.U. Mercenaries like Briggs, though necessary, were still evils. Even when their paychecks came from the new Scandinavian Union.

"Doc Briggs and I had just got ourselves stuck in a sand dune a few dozen klicks outside Mecca when the Kaaba Bomb went off, a ground blast of only a few kilotons. Fortunately we were shielded by the dune, but our HumVee was rolled over until it was a literal wreck . . ." The hubbub of the crowd was rising now, and Plone acknowledged the audience's indignation. "I say to you, my fellow Laureates, researchers and hosts, this war story directly relates to my discovery. I beg your indulgence." The vast hall became quieter, puzzlement replacing anger on the upturned faces.

"Long story short," the physicist continued, "Briggs was able to throw that vehicle back together with great skill and some other basic ingredients, which

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enabled us to get back on the road and . . ." He didn't have to fill in that blank; the whole world knew how that particular trip had ended, how he and Sgt. Briggs had brought about the end of the war. *I'm sure Doc Briggs will have something to say about that*, Plone thought.

"A year later, I picked up my research at New Mexico State University, where I had left it for my two years active service in the Reserves. And something Doc Briggs had said that day near Mecca stuck in my mind, a phrase I just couldn't forget. The fact that he essentially rebuilt that famous HumVee from nothing was just too outstanding a memory.

"From my Weblog publications since, you all understand how, up until my return, I had been stymied in my investigation of superstring theory. Then with Doc Briggs' inspiration, I was able to make the imaginative leap, and that of course led to all of the practical new 2D-ultrathread applications that now form the basis of all our electrogravitomagnetic industries."

The applause began timidly, caught on a bit, and reached a level of Scandinavian politeness, then declined. But Plone was not through, not this day. "During the project, utilizing the White Sands-Cobblestone N-dimensional nanoreactor, I discovered that superstrings were actually tubular in shape. With the Briggs model in mind, I was able to open up a superstring and lay it out flat, giving rise to the term, 'two-dimensional ultrathreads.'

"Further tests showed that the superstring tubes are the primary mechanism by which all gravitrons and chronons are transported, ducted instantaneously—or faster—all over the Universe. They provide the basic underlying structure of the Universe, and my theories show that there are no further sub-components. Opening these ducts gave us access to incredible amounts of free energy, paradox-free time travel, and the other two truly important surprises that we all appreciate so much in our daily lives."

Plone paused. From his right, Doc Briggs emerged from behind thick blue curtains. Beaming broadly, the short, muscular graying man, bedecked in tuxedo, strode across the stage to take Plone's hand. "Never saw 'em give the Peace Prize here in Stockholm, Grandy," he muttered through his thick beard, "but we'll take 'em both won't we? And you getting another one of 'em in physics, too. Ain't life a bitch?"

"Amen, Elon," Plone whispered back. "Ladies and gentlemen and alternate genders," he said aloud, "let me introduce Doctor Elon Briggs, who helped me save the world that day in Arabia, and who opened the doors to the Universe as well." Applause was still hesitant, but a little more than polite, though reluctant.

"Elon told me something that day five years ago in Arabia Felix, a profound truth. When I discovered, working from his cue, that superstrings are indeed ducts, and that when opened and laid out, they are flat, 2D ultrathreads—tape-like structures—I realized that he and all those other engineers were absolutely correct.

"Truly, the Universe *is* held together with 'duct tape!'" ■

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Gun Control

Edward Muller
Illustration by Josh Mathus

This equiptment really *did* have a mind of its own!

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Ambassador Hutchinson's enthusiasm for his first field assignment began to fade the moment he saw the dung-covered gun lying on the floor in front of Commandant Consuela's desk.

"Both are gifts from Tornback, leader of the Great Plateau tribe," Consuela told Hutchinson as the main office door fell shut behind him, the clang echoing off the walls of the hangar-sized room, a room built to accommodate several Boronian natives. A well-toned woman with close-cropped blonde hair, Consuela seemed oblivious to the acrid smell of the dung. "She was expressing her extreme displeasure at the performance of the weapons we supplied her people with."

"I was only following orders!" the gun protested. Unlike most AIs' it had a masculine voice, a voice slightly muffled by the blanket of brown excrement on top of it.

"I ordered the maintenance crew to leave the gun here so you could appreciate just how serious Tornback thinks this matter is."

"What exactly happened?" Hutchinson asked. He breathed through his mouth in an attempt to lessen the distraction of the smell. "All I was told is that I'm to be a mediator in a dispute between two tribes and that you'd fill me in on the particulars."

Consuela stood up from her chair. She had half a meter over him in height, but Hutchinson didn't find that half as intimidating as the three combat stars on the left breast pocket of her blue body armor. Hutchinson wore a similar suit of armor, as did all humans on the surface, but his left breast pocket bore only the symbol of the Amalgamation Diplomatic Corps: a dove carrying an olive branch in its beak.

"The situation is that several members of the Two Rivers tribe have killed several members of the Great Plateau tribe. Our standard policy is not to get involved in tribal disputes, but there's an element in this one that's dragged us in." She nodded at the gun on the floor. "Our guns."

"It wasn't my fault!" the gun said. It was two meters long and shaped like a cylinder with flattened sides. Two very short barrels stuck out from one end. The grips and the trigger were oversized, built for Boronian hands.

"The Mark 27 Vanderbilt, like all Amalgamation guns, comes equipped with a stage-two Artificial Intelligence. Part of the AI's job is to prevent the gun from firing on friendly forces. This prevents both friendly fire incidents and enemies from using our own weapons against us."

"I take it all Boronians are considered friendly forces," Hutchinson said.

"That's what I was told!" the gun said.

"If both sides were packing Amalgamation guns this wouldn't be a problem, but the Two Rivers tribe recently came upon a cache of Theocracy weapons, a legacy of their ill-fated invasion attempt. Theocracy weapons will gladly shoot at anything you aim them at."

"Morons," the gun said.

"Stage zero AI," Hutchinson added.

The gun chuckled. "Got that right!"

Consuela looked annoyed by their banter. She was probably one of those people who treated AI's as tools rather than as equals.

Never pass up an opportunity to be diplomatic with anything, Hutchinson's father had advised him repeatedly from a young age. It proved to be good advice. Either the extra practice or some behind-the-scenes intervention on the AIs' part had resulted in his being given a field assignment several years ahead of the normal schedule.

"A clause in our treaty with the Great Plateau tribe obliges us to assist them against any incursions by the Theocracy or their allies. Chief Tornback insists that *allies* includes Boronians who use Theocracy weapons. If you can't convince the leaders of the Two Rivers tribe to stay inside their territory and stop

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killing their fellow Boronians, I'm going to be forced to intervene. I don't want to be put in a position where I have to kill Boronians."

"I understand," Hutchinson said. "And I'm honored that you think me up to the task."

"I don't."

Hutchinson blinked in confusion.

Consuela sat down on the edge of her desk and crossed her arms in front of her. "Frankly, I think you are way too inexperienced for such a critical negotiation, but my opinion doesn't matter. Sleek, the leader of the Twin Rivers Tribe, insisted that you be the mediator. She refused to come to the stones otherwise."

"Why me?"

"She believes you're the ambassador of highest status. You've never been down from the station. Sleek's of the opinion that humans who let other humans do the actual work are the humans of highest status. I couldn't convince her that you were just a junior flunky whose job it is to rubber-stamp the decisions of his superiors."

Her words stung, but they were essentially true. Report reviewing had been his principal occupation up on the station.

"Your superiors objected. I overruled them. They washed their hands of the matter."

So that was why she's briefing me instead of them, Hutchinson thought.

"I'm not going to pass up any chance, no matter how slight, to find a peaceful solution to this crisis."

Hutchinson drew himself up into a confident pose. "I may be a junior flunky, Commandant Consuela, but I am determined that this mission will be a success." He spoke with sincerity. It wouldn't look good on his record if his first attempt at mediation failed and resulted in a war.

Think positive, Hutchinson told himself. *If you succeed, your career will be off to a roaring start.*

"For both our sakes," Consuela said. "I hope you are successful." She pulled a data pen from her pocket and handed it to him. "This contains all of the background material I have on the situation: history, dossiers on the participants, and intelligence on the weapons. Any questions?"

"I've got one!" the gun piped up after Hutchinson shook his head. "Now that this briefing is over, are you finally going to let maintenance clean me up?"

Traveling by ground on Boronia was far more dangerous and time-consuming than traveling by air, but in this particular instance there were two good reasons for doing so. First, it gave Hutchinson a chance to study the details of the dispute and the two tribes involved. Second, for as long as it took them to reach the stones, a cease-fire would be in effect between the two tribes. Time would give tempers on both sides a chance to cool down.

The convoy of Boronians he traveled with made their way along a dirt path the Boronians had dubbed "the increasingly safe highway." Wide strips of blackened tree stumps, splintered wood and bone, and shoots of new plant growth lined both sides of the road.

One hour into the trip, Hutchinson shut off his data display contacts to give his mind a rest. What he'd learned had only increased his misgivings about his ability to come up with a peaceful solution to the problem.

"Keeps getting better and better," he muttered to himself.

"What does?"

Hutchinson started. The question came from a gun holstered to one of the legs of the native closest to him.

"Are you the same gun I met in the Commandant's office?" In Hutchinson's experience, AI's didn't initiate a conversation in response to an offhand remark unless they'd built up an earlier rapport with the human in question.

"Yeah. How did you know?" The gun's

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tone grew concerned. "I don't still stink, do I?"

"No, no," Hutchinson assured the gun. "They did an excellent job of cleaning you up. You could pass an admiral's inspection."

"Good. I can nick the wings off a fly at three hundred meters, but I have to take people's word on smell."

Hutchinson glanced up at the native the gun was holstered to. Boronians resembled terrestrial cats, albeit cats the size of a terrestrial elephant, with neon purple scales in place of fur and an extra pair of limbs. All of the forty Boronians in the convoy walked centaur-fashion. Most carried guns in their forward pair of hands. The armed ones watched the dizzyingly tall walls of purple and white forest on either side of the road as if they expected an attack to spring from there at any moment. The only Boronians not carrying guns in their hands held wooden poles that in turn held up a bright red cloth canopy above the convoy. Any guillotine hawks flying overhead would mistake the canopy for a saber worm and stay well away from it. The native seemed oblivious to their conversation.

"I thought you were Tornback's gun." The tribal leader traveled several dozen meters ahead of him. The three parallel scars that ran down her back made her easy to recognize even at that distance.

"I was. She demoted me."

The canopy bearers, Hutchinson recalled, were the lowest-ranking members of the convoy hierarchy. The canopy bearer the gun belonged to now looked very old. There was a noticeable stiffness in her joints as she walked and her triangular ears didn't flick about like the other Boronians. That indicated deafness, which would explain her seeming lack of interest in their conversation.

"So what keeps getting better and better?" the gun asked.

"I was referring to my mission. I've been reading up on Sleek, chief of the Two Rivers Tribe. Sleek's first use of the Theocracy weapons she'd found was to kill off all the elders of her tribe and make herself chief."

"Nasty."

"That, combined with her unprovoked attack on another tribe and her stubborn insistence on having me as a mediator, all indicate—"

Staccato thunderclaps of gunfire interrupted Hutchinson. One of the natives farther up the convoy was firing at the forest. Splinters, foliage, and blood burst from that part of the foliage.

"What?" Hutchinson asked.

"Just a razorspring hiding in the forest," the gun said.

Razorsprings were rabbit-sized creatures with half their body mass contained in a spring-like tail that enabled them to leap up to twenty meters in the low local gravity.

"Relax," the gun said. "She got it. It's dead. It's doubtful a razorspring would have even tried to attack a group this big. The only reason she got target approval is because you're with us." The ill-fated Theocracy invasion had taught the predators of Boronia that human beings were easy prey.

"You were saying about Sleek?" the gun prompted.

"Her unprovoked attack on another tribe and her insistence on having me as a mediator all indicate a sociopathic personality. Very difficult to deal with."

"I've got every confidence in you, Ambassador."

That makes one of us, Hutchinson thought, trying hard not to let that misgiving show on his face or in his walk.

A horn that Hutchinson felt in his bones as much as in his ears signaled their arrival at the stones, an ellipsoidal stretch of pave stones whose huge mass prevented them from being uprooted by the surrounding trees. The delegation from Two Rivers tribe was already in place, sitting beneath a red canopy identical to the one they traveled under. Sleek sat in the chief's position. She matched her public name well. Her pur-

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ple-scaled hide lacked scars and seemed to glow slightly in the shade of the canopy. Boronian males were particularly partial to glowing body paints, but females normally scorned such cosmetic adornments.

Sleek is not your average Boronian, Hutchinson reminded himself.

At the edge of the stones, Tornback's party split into two groups. One kept their guns in hand and marched out along both sides of the stone ellipse to take up guard positions mirroring those of the Two Rivers tribesmen guarding Sleek's back and flanks. The remaining Boronians, Chief Tornback among them, put their weapons down before venturing out onto the stones.

"You may keep your weapons," Sleek called out. "They are no threat to us."

Amber venom glistened on the claws of several members of Tornback's party.

Is she trying to provoke a confrontation by insulting us? Hutchinson wondered.

"Then we permit you to keep your weapons as well," Hutchinson called back.

Several members of Sleek's party went back to the far edge of the ellipse and brought back their guns. Theocracy weapons. Black, boxy killing machines. They didn't look like they had enough punch to stop a saber worm or a guillotine hawk, but they could easily kill a Boronian or a human being.

I've just given them a big advantage if things go wrong, Hutchinson thought.

"We have come under the ancient laws to find a way through the forest that separates us," Hutchinson said once he was close enough to be heard without shouting.

"As have we," Sleek replied. "I propose our tribes exchange territory."

"The territory of the Two Rivers tribe simply isn't big enough to support all the members of the Great Plateau tribe," Hutchinson replied calmly.

"Then we take their males as our own."

Tornback and the members of her tribe responded to that suggestion with a chorus of low-pitched growls that shook Hutchinson's backbone. A good portion of Boronian hearing and speech fell in the infrasonic, but he didn't need to hear all the words to get their meaning. Not only was venom glistening on the claws of the various members of the tribe, several had raised their tails up and to the side as if preparing to swing them.

"Even then the land would not be big enough," Hutchinson said. An outright refusal could end the negotiations and resume the fighting between the tribes.

"How many of them will we have to kill before it becomes big enough?" Sleek asked, caressing the side of her gun.

She can't be thinking of starting a fight on the stones, can she? Hutchinson thought. Spilling blood on the sacred stones would be a sacrilege great enough to unite every tribe on the planet against the Two Rivers tribe. It would be an insane thing to do, but assassinating all of her tribal elders had been almost as insane.

She'll keep pushing until she's pushed back, Hutchinson thought. Unfortunately, a lot of innocent Boronians would die in the process.

"Guns require ammunition," Hutchinson said. "Do you have that many bullets?"

"You think I tell you how many we have?" Sleek said. "You think me stupid. You run out of bullets. Amalgamation send you more. We run out of bullets. Theocracy send us more."

"Are you even able to contact the Theocracy?"

A human walked out from behind Sleek. Skeletally thin, he moved slowly and with a limp. Instead of blue body armor he wore a tattered uniform of bright white cloth.

A Theocracy soldier, Hutchinson thought. There'd been rumors about survivors from the Theocracy invasion liv-

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ing in the forests, but no proof until now. It made sense. Someone had to have taught the Two Rivers tribe how to use those weapons.

"The Amalgamation will not permit the Theocracy to send supply ships here," Hutchinson said.

"How will the Amalgamation stop them? Their guns are worthless against those of the Theocracy!" Sleek raised her gun. "Let the one among you who thinks their gun is better than mine come forth. I will even allow my challenger to shoot first!"

The rumblings from the Great Plateau tribe grew louder. Hutchinson's own thoughts were a desperate whirl. The situation was going more out of control with every second. It was only a matter of seconds before somebody went over the edge and started a fight. He had to do something to salvage the situation, but what? Reason wasn't working. Sleek wasn't reasonable. The only thing that would reach her would be force.

Nick the wings off a fly at three hundred meters.

"All right", Hutchinson called out as loudly as he could. "I accept your challenge."

A shockwave of silence spread out over the assembly. Even Sleek seemed taken aback.

"What you say, human?"

"I said I accept your challenge. We duel. You with your Theocracy gun. Me with an Amalgamation gun. I get the first shot."

All eyes watched him as he turned and walked back to the Great Plateau tribe.

Tornback offered her gun, her ears pulled down warily, as if she wasn't sure that Hutchinson was entirely sane. Hutchinson folded his arms in front of him to politely decline the offer.

"I will use the least of our guns," Hutchinson said loudly. "For the least Amalgamation gun is better than the best Theocracy gun." He went over to the pole bearer. Deaf or no, the elder Boronian seemed to understand what was happening well enough to offer her gun to Hutchinson as he approached.

Hutchinson strained under the weight of the weapon. By balancing it on his shoulder he managed to get it into a position where he could aim and reach the trigger.

"Uh, Ambassador, as much as I appreciate your choosing me, I have to warn you that I'm still forbidden to shoot at a Boronian, even Sleek."

"Does that prohibition extend to Sleek's weapon as well?" Hutchinson whispered.

"No, it doesn't," the gun whispered back.

"Then disable her gun."

Hutchinson left the stones and headed for the cleared ground that surrounded it. Sleek did the same, though her gait indicated that she'd lost some of her earlier bravado.

Hutchinson aimed the gun at Sleek, trusting the gun's own targeting mechanism would do most of the fine work from there. He then tried to reach for the trigger, but as he moved his hand forward the gun threatened to slip from his shoulder.

"I can fire on verbal," the gun said. "Just say the word *shoot*."

Hutchinson had never fired a gun in his life. He braced himself as best he could for the terrible recoil he felt sure would come.

"Shoot!"

The actual gunshot proved anticlimactic. A balloon pop accompanied by the gentlest of taps backward.

Sleek's gun looked completely whole.

"You miss!" Sleek called out. "My shot now."

How the hell could I have missed? Hutchinson wondered as Sleek raised her gun. What had he done wrong? His sense of letdown and betrayal were so great that the thought that he was about to be shot dead hardly intruded.

Sleek's gun exploded in her hands. Sleek grabbed at her face and let loose

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with a terrible groan. Blood flowed from between her fingers. A moment later she fell on her right side with an impact Hutchinson felt through the soles of his boots.

"That's the problem with Theocracy guns," his gun said. "They'll never refuse a shot, even when their barrel is blocked."

"You fired the bullet up the barrel of her gun?" Hutchinson asked.

"I figured it was the best way to disable both it and Sleek."

Hutchinson put the butt of the gun down on the ground and let go with a long, shuddering sigh of relief. He then looked up and saw that all the members of both tribes had their attention fully fixed on him.

"Does anyone else now think that Theocracy weapons are better than Amalgamation weapons?" Hutchinson asked them all.

None of the Two Rivers tribe answered him, and none met his gaze as he looked at each member in turn.

"These are my terms for peace between us. You will surrender all Theocracy weapons and your Theocracy soldier to us as reparations for those Boronians you've unjustly killed."

Moving as one, the Two Rivers tribe put their guns on the ground.

"No!" the Theocracy soldier yelled. "You can still defeat the other tribes."

A chorus of Amalgamation gun voices on the Great Plateau side of the stones saying "Target approved" shut him up.

"You didn't survive on this planet for this long by being stupid," Hutchinson told the soldier. "Surrender."

The Theocracy soldier lowered his head.

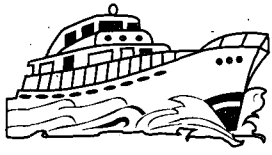
As he returned to the stones, Tornback and the other members of the Great Plateau tribe made chuffing noises, the Boronian equivalent of applause.

Hutchinson offered his gun to Tornback.

"Here," he told her. "A diplomat has little use for a gun."

Tornback hesitated, no doubt torn between being obliged to take up a weapon she'd previously cast aside and the great honor of being offered the victor's weapon. In the end, she took the great honor and accepted the gun.

"A diplomat may have little use for a gun," the gun said as Tornback lifted it up, "But this gun sure had need of a diplomat. Thanks!" ■



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The Strange Redemption of Sister Mary Ann

Mike Moscoe

Human understanding relies on models, and it's not always clear which one is closest to truth.

She lay in Bill's arms, his soft snoring merging with the chirping of crickets and croaking of frogs. They'd slipped out of the cabin to make love under the full moon. Now he was asleep and she was warm. Even after twenty years, she floated on the love she'd felt for him the first moment she saw him.

As she cuddled closer to his chest, the arm he'd thrown over her brushed a breast and her nipple grew hard again. She felt a sneaky smile growing, along with a lot of other things, and considered how she might wake him up. Up was such a nice word when the kids were asleep.

"Mommy, play with me now," came with that blend of plea and demand babies got so good at. But the kids were almost seven and she was more often Mom than Mommy.

And the voices were all wrong.

She glanced around the moonlit yard. Below her a frog plopped into the lake. Around her the first of summer's fireflies flit. No. Those weren't bugs.

At the heart of each little light, a tiny baby wiggled. "Come on, Mommy. Play with us a while. Please," a shrill voice demanded.

"Mommy can't play with you," Mary Ann said, the warmth of Bill's love-making lost to a chill. "You were never born, little ones."

Sister Mary Ann came awake with a start as the cancer eating her gut shot a pain through her that almost knocked her off the kneeler. The other nuns were so solicitous of her, come late to the convent after a full life in the world and now so sick. They insisted she use the *prie dieu* to save her knees.

With a shrug, Mary Ann, slipped off the kneeler and onto the cool tiles. That should keep her awake, keep the dreams at bay. Mary Ann had volun-

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teered for the two A.M. shift of this forty-hour devotion as her penance, though she hardly counted staying awake any sacrifice. She slept little these days.

And here, in the early morning, the crickets humming in the dark outside the thick adobe chapel walls reminding her of other times. The scent of the unworked wood that made up the ancient-style roof above her head brought back memories.

These were the smells of the house by the lake that she and Bill took the kids to for a week each summer. And late at night, when the exhausted children were abed at last, she and Bill would make love on the couch, the windows open to the chirp of crickets, the aroma of pine cones and evergreens mixing well with the scent of their lovemaking.

Sister Mary Ann recaptured her wandering thoughts and herded them back to familiar prayer, asking a loving God to look after the four children she had given life to, loved and cared for and who now lived busy lives of their own with wives and husbands, children and maybe even a grandchild. Those were easy.

It was more difficult to ask that same loving God to forgive her the sins she had let science commit on her body. Here, her scientific training still battled with her faith. This close to death she tried to simply submit to Holy Mother Church's decree. Still her mind questioned. With a sigh she once again forced down her doubts and said her penitent's prayers.

The last prayer was the most difficult of all. How did she pray for children she'd never known, the ones that had vanished so quickly across death's door, if indeed they had ever lived? *Oops, don't argue. Submit. That cancer won't wait forever.* She had no names for those little ones. She didn't even know how many they were, a hand full, dozens? She had never bandaged a knee for them, shouted at their ball games, cried at their weddings. They were the hard ones to pray for, so she tried to pray for them the most.

Sister Mary Ann did not bother praying for herself. The cancer held her tight in its embrace . . . it would not let her go. The cancer's pain didn't bother Mary Ann all that much. She had lived long enough; she'd sinned as much as seemed convenient. Now her body offered her a painful penance. Penance and sacrifice had never been a part of her life, not around Bill and the kids. Now it demanded center place and she approached it more from curiosity than anything else. Life had taught her many lessons; what was she to learn from this?

Most lessons she learned the hard way. Like putting off and putting off. Finally happy with life and career and ready to find a place in her full schedule for children, she found that she was barren.

In an earlier time, that would have been that, but science offered her options. The Church had definite opinions on such matters, but when the men and women in their immaculate white coats offered her choices, she and Bill took them without a moment's reflection. She was surprised how much pain there was as the docs went about harvesting her own eggs. She watched with Bill from behind thick glass as the specialists dripped his sperm into the dish with her eggs. It felt strange more than anything else when they returned the fertilized eggs to her motherly protection. Of the eight eggs inserted in her uterus, four took hold and grew.

Allen, Becky, Charles and Diana came into her life, squealing, squalling, growing, learning . . . needing more than their fair share of her life. E, F, G and H had not made it. Failed to implant, failed to thrive. At thirty-eight, Mary Ann had shrugged off the doctors' bland words, joyful at the four she birthed. Glad not to have to go through all that again, she hadn't thought a moment before signing away to research programs the other eggs they'd taken from her.

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Busy with her new world, she'd felt just as permanent, just as immortal as any of the other mothers working, homemaking, driving kids here and there, and being driven up every available wall by them as well.

It was years later before she began to wonder at what she had done. Only when Bill was in the final stages of his illness, pain-wracked and needing her. She spent every waking moment with him, staggering home only to fall in bed for a few scanty hours before returning to the hospital.

That was when the lost children came back.

They came back to fill her dreams with their presence, to fill her muzzy head with waking questions, creeping doubts. Watching the flesh of the man who had held her for forty years wither, the sparkle in the eyes that had lit her days and nights dim, she could not close her eyes without wondering if maybe she had done something wrong to deserve this.

For six months after Bill passed on, the tiny children would not leave her nights. Mary sought solace in work, in friends, in family. A older friend suggested a quiet place, far back in the wilderness of New Mexico. There, on retreat at the Convent of Our Sorrowful Mother, Mary Ann found repose.

In a rushed month, she did it. She called the children together, told them of her decision, listened to them as they laid out all the reasons not to do this mad thing. Then she laid out her reasons for taking the habit so late in life. She never mentioned the tiny children.

"Mom, I don't think I'd ever do it, but I can't say it isn't the best thing for you," Diane had said, speaking for her children, her born offspring.

Mary Ann took less than a month to finish matters. Had she thought long, maybe she would have thought herself out of it. *So don't think.* She sold all she owned, split it among her children and the convent, and signed herself into the cloister and its ancient rule, though not the ancient names . . . times had changed and Mary Ann became simply Sister Mary Ann.

If names were not different here, life certainly was. She spent her days with women who thought a power lunch was Sister Rose reading from the Rule of Saint Benedict. Poor Rose was hard of hearing and shouted the rule at the top of her lungs. A killing in the market for Sister Carmella was a hundred pounds of wheat bought at market-value and milled for free. Mary Ann thanked God for her sense of humor. It was often all that saved her as her old life juxtaposed itself on her new one.

The sound of her own soft chuckle reminded Mary Ann that her prayers had given way to distraction . . . again. She focused her thoughts on the statue of Mary before her; it was special for her. No fancy dress for this Madonna, she wore an apron. The sleeves of her smock were rolled up to her elbows. This woman was a seriously working mom. Still, one hand rested on the head of her eight-year-old son who held a hammer and saw. She smiled down like any mom sending her kid off to work with dad.

That first morning on retreat, the busy mother, smiling after her Son had filled Mary Ann's waking dream. Truth be told, that reflection of mother and child had a lot to do with her being here, accepting her vow of permanence, no more to wander the earth but stay here all the days of her life.

And God in His or Her divine humor had seen to it that her days here would be short.

Lord, but the human mind can wander. Sister Mary Ann concentrated her thoughts on the mother before her. *Please Mother Mary, take care of my children. Bless Allen and Becky and Charles and Diana. Bless their wives and husbands and kids. And Mary, hold close the littlest ones that I never could. Give them the hugs and kisses I*

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couldn't give. And tell them their mother really did love them.

Finally, a prayer.

Then the pain hit, and the darkness took her as she slumped to the red tiles of the chapel's floor.

She stood on a cliff. The gale winds billowed her habit out behind her, black against inkjet night and sky. Cloth tight against her breasts and belly, her flesh tingled as if Bill were running his fingers up and down her, slowly, gently readying her for him. There were stars before her.

No. Not stars. Lights! Tiny lights that danced on the wind. "Mother, come," they called to her in tinkling voices. She took a step forward; her sandaled feet found only air. Without a thought, she took two steps back from the edge.

"Oh, mom! You promised you would play with us." The voice was Allan's, almost. His and not his. She studied the lights. One held in place, tiny arms folded over a chubby chest. Again, not quite like Allen.

"I can't come, children. Mom's too big," Mary Ann said.

Sister Mary Ann awoke to the antiseptic smells of the small infirmary. Mother Superior sat in the chair next to her bed. Sister Veronica's tall, thin frame hovered behind her.

"Are you all right?" Mother Superior made the question more an order. She put the same definite tone in every word she spoke. Rome saw no need for nuns wasting their time in contemplation, kneeling in chapels. The laity were in the world, curia bureaucrats pointed out, and that was where the church and its servants belonged.

But this diocese had a young bishop, who maybe paid a tad more attention to his flock than distant bureaucrats did. He and Sister Superior met only once to discuss the Will of God for a certain small group of women and the good bishop had gone away to tie up Roman powers-that-were into legalistic debates that ought to outlive them all, if not God Himself.

"No worse than usual," Sister Mary Ann assured her last superior on earth.

"Do you need to return to the hospital?" That truly was a question. A rarity from Mother Superior.

"No." The word was simple, short, but so laden. Diagnosed with cancer, Mary Ann had dutifully suffered all that modern medical science required of its victims. Having once become a mother, she thought there were few new outrages the white-smocked medics could commit against her. She had been wrong but she endured it all for the required length of time.

She felt neither surprise nor regret when the doctors gathered to admit they could not count her among the lucky ones. Mary Ann had enjoyed so much good luck in her life; she felt no right to bemoan some bad. Of course, the doctors were not willing to admit defeat . . . they had option after option to extend her life a week, a day, a minute longer.

She'd posed her question to the hospital chaplain, who brought in the diocecian moral theologian. Under official church teaching further measures could be deemed "heroic" and not required of her. She'd signed herself out of the hospital, mentally shaking its sterilized dust from her sandals.

Her four children had not been so easy to leave. They'd shown up with family in tow. The goodbyes had gone long. Tears there were, and laughs too. Goddamn it . . . *oops, sorry, Lord* . . . Mary Ann had insisted there be laughter. They all knew when they left her she would not cross the cloister wall again before the funeral mass. No, it was Mass of Resurrection, now. So many changes when you lived a long life.

"You are tired. Rest," Sister Superior ordered.

Sister Mary Ann nodded agreement and was left to Sister Veronica's gentle

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ministrations.

"The kids come again?" Rana asked when they were alone.

"Yes," Mary Ann said. "Shining like little stars. So many of them."

"M.A., give them to God." Like Mary Ann, Veronica had come late to the cloister door. Rana had been just about every kind of nurse a hospital needed, from the ER to Psych ward. She'd seen it all. Done quite a bit of it, too. Rana and M.A. often shared smiles at what went over the innocent heads of the others.

"I've given them to God. I gave them to Jesus. I've asked Mary to give them a hug." Mary Ann shook her head ruefully. "Why won't they leave me alone? Why do they keep coming back to haunt me!"

"M.A.," Rana said softly, "I had three miscarriages while I was having my three girls. A friend of mine lost six getting her lone child. Every woman born has lost kids if she spent any time intimate with those goons we love for God only knows why. Maybe as many as half of our pregnancies end that way. And now the researchers are telling us that every time one of our eggs meet up with their wiggly things, as many as half never manage to hook up to our uterus and even start a pregnancy. Face it, M. A., those of us that get born are a minority."

Mary Ann found herself laughing. "So how come the poor high school girl catches in the backseat her first time at the drive-in? Why would God make her have to tell her boyfriend, their parents, that she's in the lucky quarter while I spent years telling my husband 'not this month?'"

Rana snorted. Mary Ann could almost hear her friend say "just the luck of the draw." As twenty-first-century women, they lived in a world where science hunted for the truth by repeatable evidence. But now they wore the habit in holy cloister. They were sworn to believe God had a loving plan for each and every child of His even if, as women in the world, they might rarely have caught a glimpse of it.

So why had Mary Ann decided to end her life here among women of faith? Herself a woman of faith believing without evidence . . . even against the evidence.

From the look in Rana's eyes, she could hear every word M. A. was thinking. She rested a hand on Mary Ann's arm. "You want a pain pill?"

"No. It's not that bad," Mary Ann lied.

Rana shook her head, not taken in, but accepted Mary Ann's need for relief beyond what pills offered. Sister Veronica tucked the blankets around her friend as she might a loved child. "I'll bunk down in the hall. If you need me, holler."

"Thank you," Sister Mary Ann said as she composed herself for sleep. The pain was there, always reminding her of the cancer devouring her life, cutting short her time for questioning.

For Mary Ann, there was something very wrong about her body turning on her like this. She remembered how Bill had made her body sing with passion. He played her more expertly than any man had ever played an instrument carved of wood. And she'd gone through her day, still vibrating with his love, sharing her joy with family, friends, the world.

That was the way it should be.

So why was she wracked with cancer? What was God trying to tell her? Did God even notice?

Because this certainly was not the way she wanted to be, cancer poisoning her body, letting the sharp pain in her gut slip into her words, reducing her to the one cared for when all she wanted to do was care for others.

As a woman of faith, she'd been taught that God revealed himself through his world. *Even our bodies proclaim His love*, had brought a blush to the young nun reading the passage at lunch. Mary Ann did not blush, she'd married a good husband and come by her memories with lusty honesty. No, it

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was the here and now that puzzled her. Was this pain, devouring her flesh, making her struggle to keep a smile on her face, something she was supposed to offer up for all the pleasure she had taken? Mary Ann shook her head, that theology rang hollow in her ears no matter how many times the visiting priest on Sunday rambled back to it in his homilies.

Mary Ann returned to the one thing she knew was true. She was dying. Soon the world would go on without her. Neither she nor Rana expected some kind of quiz would come next to determine heaven or hell for them. Still, Mary Ann was disgusted with herself. Here she was living under Death's coattails and she still had no idea about something so basic as why she was hurting. Biology told her how she hurt. But after all her years she still had so little wisdom about why.

She risked the pain to roll over on her side and arranged pillows to let her rest a bit more comfortably. Surely, God would not hold that against her.

She slept, and the children came.

She sat on a log beside the lake. She could hear Allen and Becky arguing over who got the back of the canoe; who got to steer them out on the lake. They'd still be arguing at Christmas whether the east or the west end of the lake was the most fascinating.

"Mommy, can we swim?" was so plaintive. She looked around. Nothing. Then she looked down. Around her on the grass were dozens of tiny, naked children.

"Do you know how?"

"Of course we do, mom. We're not babies," one shouted as she slipped off a toadstool and raced for the water's edge. For legs so tiny, it should have taken them hours to reach the lake. They were splashing and laughing in only a second.

"Come on in, mom, its wonderful."

Mary Ann tossed off her heavy winter coat and started untying her boots. By the time she had both boots off, the coat was back on. She repeated the process four or five times before she stopped, puzzled.

"Come on in, mom."

"I can't. With my boots on, my coat, I'll drown."

"Take 'em off, mom."

"I can't. They won't come off."

A small naked figure walked from the water. She folded her arms across her chest and tossed her head to the right just like Diana. "If you won't get rid of all that stuff, how can we have fun?"

Mary Ann awoke in the night. The sharp pain from rolling onto her back had ended that dream. Dream?

She remembered the first time Rana tried to console her, describing when the pregnancy test first turned blue for her, only to be cramped over and gushing a week before she could get in to see a doctor about her pregnancy.

"Your mom, my mom, Mary Ann, would just have called it a late, hard period and forget the whole thing. We took the pregnancy test when we were four or five days late. It tells us we're caught and we get excited. Then comes the blood and we aren't." The nurse had raised her hands, palms up. Then flipped them palm down.

Mary Ann had shaken her head, repeating what she'd heard over and over again in sermons or screamed by the Right-to-Lifers. "But every conception creates an immortal soul." Mary Ann had heard it so often; did she believe it? Did her dreams tell her to believe it? Or were they just the crazy final imaginings of a brain facing the unknown and trying to make up an answer?

Back then, Rana snorted. "Yeah, every conception is an immortal soul if you're a celibate man sniffing around for a nice, clear break point to hang an argument on. Just once, I'd like to see one of those celibates tell that to a wife who's reduced to tears. A wife who really knows

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what 'Rachel, weeping for her children,' is all about. There she is, a woman reeling with hormones from hell, grieving for all the nights she won't rock that babe to sleep, the butterflies they won't bring her. And here's a guy spewing all that theological crap he hasn't thought through. Bull."

Harsh words for a nun, but Rana had been a nurse first.

Rana the nurse was suddenly at Mary Ann's bedside. "You okay, M.A.?"

"Did I make that much noise?"

"I'm a light sleeper."

"Are you keeping the death watch on me?"

"How cold are your toes?"

"Icy."

"I'll get another blanket. Should I call for a priest?"

Mary Ann checked her conscience, like she had her gas gauge when she was running kids to music, gymnastics, soccer, et al. There were no new sins. The old ones were enough, thank you. "Can you stay with me?"

"Do I look like I have any place better to go, girl?"

Rana returned with two blankets, spread one over Mary Ann, then left the other doubled over her feet.

Mary Ann didn't feel any warmer. "Rana, do you believe every time an egg and sperm meet God creates a new soul?"

"I honestly don't know," the nurse and nun answered with her usual bluntness. Then she frowned in thought. When she began to speak, the words came slowly.

"I met a very fine Presbyterian minister once." Rana smiled at her description, or maybe at the memory. Mary Ann warmed to the girl-talk even as the rest of her grew colder. "Preacher man liked the way we Catholics baptized kids. 'God acts, man reacts,' he said. 'When we wait for grown people to make their own decision, it sounds like God is stuck reacting to us.' Kind of makes you think. He also thought the root of most of the big heresies was people thinking they'd found the golden ring that let them haul God around by His nose."

"So he'd say that two kids fumbling in the back seat doesn't mean God has to—"

"Or a lab technician fertilizing and freezing spares that will probably never be implanted in your womb. Do you really think that God would let them have control over Him?"

Mary Ann breathed on that thought for several minutes. "Kind of funny. Half to three quarters of all starts never finishing."

"And that's before you bring in human intervention and the 'A' word."

"But what if the men are right and all those souls do get started?"

Rana thought on that for a long moment, then grinned like an evil elf. "The preachers and priests make a big thing about Jesus coming to save sinners. They say we're blessed with the Word of God and the sacraments. Now wouldn't it be a laugh on them if the vast majority of souls slip right into God's arms without being touched by any of their holy stuff?"

Mary Ann tried to laugh, but couldn't find the air for it. She settled for a wan smile. "You don't believe in Limbo."

"No way, Saint Josié. My God doesn't leave folks halfway to nowhere."

"So my children . . ."

"Are waiting for you, M.A., praying a lot more for you than you are for them."

"They want me to play with them."

"Go play, dear friend. Go play with them."

Mary Ann's ears must be playing tricks on her. Rana wouldn't have choked on her words. Mary Ann closed her eyes. The pain was going dull. That felt better. She was tired. Maybe if she slept for a moment she could finish talking to her friend. There was something she wanted to say. Wouldn't do to let the old nurse have the last word.

The children were splashing in the

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water, giggling. "Oh ma, you can come in. Please," a tinkling voice wheedled.

Usually it was the kids wheedling to get into the water. Why would they want to get mom in? To splash me, of course, to get my hair soaked so it would be wild and stringy for Bill tonight when the exhausted kids were sound asleep and we had the living room to ourselves, to make love slowly with the door open mixing lake sounds and smells with our love making.

"Mom, are you going to play with us or not?" a childish voice pouted.

Mary Ann tossed off the winter coat, attacked the sweater beneath. And the coat under it, and the next sweatshirt.

"Mother, if you don't come in now, it'll be too late." The young voice sounded like its heart might break.

Mary Ann walked into the water, booted feet keeping her ankles straight despite the large rocks rolling beneath her tread. Two tiny forms started backstroking out into the lake. They grew with each stroke, baby fat giving way to rangy preadolescent bodies that with another stroke bobbed with the extra flesh and hair of maturity.

"Mom, you have to come in now." The mature woman's voice was low with urgency, intent eyes sparkled and dazzled.

Mary Ann walked. The boots and coats weighted her down. The water was up to her chest, her chin, her nose.

"That's it, mom, keep coming. You can make it!"

The words echoed a younger Mary Ann's own pleadings, urging a child to swim another stroke, pedal another yard.

The water rose over her head.

She couldn't breathe. She kept walking.

"Come on, mom!" filled her ears.

She shed the coat, pulled the sodden sweater over her head. The buttons of her blouse fought her. She ripped the last one off. The boots each took a kick. The pants and panties went together. The bra snagged. Bill would have gotten it off in a snap. She felt herself sinking. She yanked the bra over her head, and kicked for the surface.

"Mom! We knew you'd make it!" greeted her.

She treaded water, looking around at dozens of familiar yet strange faces. "Where's Bill?" she asked urgently.

A face like Allen's, but not his, shook sadly. "It's so difficult for you born people to get free of what you can't have anymore. It's so hard for you to give it all up. But if you hold on to it like Dad, it drags you down and you lose all that is to come."

Mary Ann sank into the water, hardly stroking as her weight carried her down. The weight of Bill, of the children she'd raised, of everything that she loved in the world, pulled her into the darkness.

"Mom, please," was a terrified scream.

"Please, mother, please, for us. We've waited for you. Don't you have any love for us at all?"

The pressure of the water around Mary Ann grew great, driving the breath out of her. Her life full of memories fought with the children that were strangers to her. The two battled for her heart, her love, her eternity.

"Go on, dearest friend," came to her in Rana's soft voice. The old nurse's voice came familiar but with no pull, no attachments that called Mary Ann back.

With a final act of the will, sharp as any cancer pain, Mary Ann brought her arms down hard to her side, pushing herself up to the light. She shot through the surface of the lake like a beach ball held down too long and fell back among the glistening bodies of her never-seen but never distant children.

Mary Ann felt their touch as she reached out for them. "Mom's home, kids." ■

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HOW MUCH CAN ONE MAN MATTER?

You've heard of the "Butterfly Effect" of course. That's the idea that a butterfly somewhere in South America flaps its wings and later a hurricane rips through Florida as a direct result. This notion comes from chaos theory. The idea is that weather is so highly nonlinear that, under the right conditions, even so small a thing as the motion of a butterfly wing can have a huge effect later on down the road.

This idea is simple enough to understand, but how would you test it? At any one time, there are millions of butterflies flapping their wings. Could we ever find the one to blame any subsequent hurricane on? Indeed, at any one time, there are trillions of other things causing equally small disturbances in the air: a woman fanning herself with a program at a play; a boy releasing a rubber band powered airplane; a mouse farting.

The Butterfly Effect metaphor is also extended to people every time a child is told he can make a difference in the world. Though true, it's true in the same way it's true with butterflies—not every beating wing begets a hurricane; not every difference made ultimately makes much of a difference. So with election time just around the corner as you read this, and candidates campaigning on platforms that always amount to nothing more than "I can make a bigger and better difference than can my opponent," it is worthwhile to think about this a bit.

Surely, some might think, there are scientists who have genuinely made contributions the size of hurricanes in the "atmosphere" of science. No doubt Einstein comes immediately to mind, for without Relativity theory, where would physics be today? But this is the wrong way to frame the question—it presupposes that Einstein was indispensable to the development of Relativity as it is practiced today, and this is simply untrue. Einstein's 1905 "special relativity" paper contained nothing that hadn't already been published by Lorentz, Poincare', and Larmor. [See pp. 145-147 of *Retardation and Relativity* by Oleg D. Jefimenko (ISBN 0-917406-21-4), "References and Remarks for Chapter 6," the first four entries.] What about General Relativity? Was Einstein indispensable to our understanding of gravity? The answer, again, appears to be no. In the preface to one popular textbook on gravity, the authors state: "It is the objective of this book to develop gravitational theory in the most logical and straightforward way—in the way it probably would have developed without Einstein's intervention." [See page *xi* of *Gravitation and Spacetime* by Ohanian and Ruffini (ISBN 0-393-96501-5).] Without Einstein our physics texts would still look very much the same as they do today. We just wouldn't refer to super-bright physics majors as "the next Einstein."

Are there any important inventions we enjoy today that would never have existed without their famous inventors? This answer is also probably no. When you look at the history of famous inventions, it is usually the case that the equally famous inventor was the *first* to build

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a *successful* version. Hence, without Watt, we would still have steam engines. Without Edison, we would still have electric lights. Without Marconi, we would still have radio. Indeed, in this last case, the famous inventor didn't even invent what he's credited with. The actual credit goes to Tesla. [See *Wizard: The Life and Times of Nikola Tesla, Biography of a Genius*, by Marc J. Seifer (ISBN 1-55972-329-7).] But if not Tesla, someone else. A more important invention of Tesla's was the modern AC power grid, but again, if not Tesla, someone else.

However, if Tesla had been successful with his Wardenclyffe project to transmit both radio and electric power wirelessly, that might have made a hurricane-scale difference to history, since no other inventor was even remotely on the way to doing that the way Tesla planned to. Nor were any other inventors as uniquely brilliant as Tesla in the field of electrical engineering. But he ran out of money, the project wasn't completed, and we'll never know.

As I mentioned earlier, the elections are coming. Are there any political figures who genuinely made unique differences to which they were indispensable causes? The United States would certainly have had another father if George Washington hadn't come along, though the Revolutionary War might have gone very much differently. Without Winston Churchill, England may have lost the Battle of Britain. However, without Churchill someone else may very well have worn the same mantle. But it is hard to imagine that Germany would have adopted her uniquely evil Nazi persona without Hitler. Certainly, Hitler had help, willing accomplices to put into practice his crazy, brutal ideas. But they were followers, not leaders, and there was no historical necessity for Hitler. True, Hitler likely could not have come to power if there had not been the economic strangling of Germany post World War One. It may even be likely that the times would have produced another powerful German leader who would have taken the country into World War Two. But it did not have to be someone as uniquely awful as was Adolph Hitler.

In my Alternate View for April 2004 ("Edward Teller, R.I.P.") I described Edward Teller as the kind of man who had also made a genuine difference, for good in this case, to the world. I went so far as to boldly state: "Had it not been for Teller, the Soviet Union would have beaten the United States to thermonuclear weapons, and it's not at all unlikely that we might now all be speaking Russian if they had." While I was working on this essay, Stan Schmidt forwarded a potential Brass Tacks letter to me from Scott T. Meissner. (I don't know if Mr. Meissner's letter ultimately made it into Brass Tacks or not.) Therein, Meissner says about my assertion above, "... to claim that the U.S. would have lost the cold war without Teller's efforts to get the U.S. the thermonuclear bomb first, seems a bit of a stretch." He notes that the U.S. did, after all, have atomic bombs, and asks the question: "Doesn't either weapon (A-bomb and H-bomb) have enough holocaustic capacity to impose a terrified state of mutually assured destruction?"

Well, that's a good question to answer in a doctoral dissertation. But this is a Science Fiction magazine, so I'll instead explore my claim with a little bit of alternate universe brainstorming, and bear in mind, I said "might."

Suppose that, for whatever reasons, Teller lost interest in pursuing work on the Hydrogen bomb after the war, so there was no passionate advocate for the project, certainly none with Teller's level of expertise. A-bomb work would have continued, and the consternation felt when the Soviet's detonated their first A-bomb in 1949 would also have been the same. The Intelligentsia of the era would have denigrated the achievement as more the result of clever spying than of superb talent in nuclear physics. They would not have felt it necessary to pursue work on the H-bomb because they

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already thought it was unlikely to work, a view based on Teller's own earlier studies. Also, the U.S. still held the lead in the development of atomic weapons, with an ongoing robust program. It would have been felt that the U.S.S.R. would forever be playing catch up.

When the Soviets do test their first H-bomb, scientists in the U.S. are confused as to the actual nature of the device. Was it just a huge fission bomb? (It *is* possible to make an A-bomb that will yield up to the megaton range—it's just a waste of material.) Having no thermonuclear program of our own, it's not so easy to recognize the test for what it is.

Eventually, the Soviets will put to use the psychological advantage given to them by their new weapon, and they certainly needn't be straightforward in their dealings with the U.S. Suppose that their first public demonstration comes as the result of an intentional accident?

Imagine the following scenario. A Soviet military ship cruises along the U.S. coast, relatively near Washington DC or perhaps New York City, though remaining in International Waters (for various reasons, figure about 12 miles offshore). On board is a 50-megaton device. Sometime prior to the demonstration, a communication is received from the Kremlin that said ship is having a problem. The crew is evacuating. They tell the U.S. that "an experimental nuclear mine" is involved and warn that bombing the ship will cause an explosion. They apologize. Hours go by while concerned parties work with the Kremlin to figure out what to do.

The Soviets make it look good. They have a full crew aboard the ship that really does need to be evacuated. Few aboard have even needed to be in on the plot, so as they are rescued and end up aboard U.S. Navy ships, they provide little useful information about what happened. All they can say is, "The meters redlined and we were told to leave," or words to that effect.

Top nuclear experts in the U.S. are called together or connected by telephone. Most of them doubt that the U.S.S.R. has actually built a thermonuclear weapon, let alone that they'd be making mines out of them and floating them around the world on ships. But Teller perhaps, in this alternate universe, argues that the secret tests we noticed several years back really *were* of "the Super," and that a truly devastating accident may be imminent. Arguments ensue.

Meanwhile, the planned for amount of time from the initial warning of a problem has ticked off and the device explodes. The result? Since the ship is out to sea, both prompt radiation effects (no one close enough to irradiate) and heat (no one close enough to burn up) can be ignored. Wind might be a problem—twelve miles away from a 50-megaton explosion wind speed still tops 130 miles per hour, so coastal structures will be treated to a very strong hurricane-force gust. What will be genuinely devastating is the literal blast wave of *water* that will roar into shore—compared to that, the wind damage will be inconsequential.

The Soviets say "Oops," apologize, and offer to help in any way they can. The American leadership and American public examine the billions of dollars in damage done by this accident. They try to come to grips with the fact that this one bomb exploded with a force equivalent to a thousand of their bombs, and this at a time when the U.S. doesn't even have a thousand bombs. They think over what might have happened had the Soviets *intended* to cause harm.

Shortly thereafter, the U.S.S.R. begins to throw its weight around in Europe and Asia, but leaves the U.S. alone as long as it refrains from interference. So the U.S., as a second rate nuclear power without any thermonuclear technology of its own, does what?

I don't know. Perhaps the U.S. does nothing until it is too late to do anything, and the U.S. becomes a Russian-speaking nation. I've long been shocked

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by just how intransigently gullible the Intelligentsia can be when it listens to lies spoken with a flourish and a smile. On the other hand, I am also shocked, though pleasantly, by how long it has taken the world to get to Hell given that we've been headed there in a hand basket since I was a kid. At least, that's what the adults told me. Perhaps everything would have come out pretty much the same anyway.

Nevertheless, I for one am happy that I inhabit that Universe in which Edward Teller flapped his wings. ■

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Explore the *Zenith Angle* (rescheduled).

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EXTRA INNINGS

Robert Scherrer

What do you *do* with all the time in the world?

" . . .The current cosmological epoch has no special place in time. In other words, interesting things can continue to happen at the increasingly low levels of energy and entropy available in the universe of the future."

—"A Dying Universe: The Long-Term Fate and Evolution of Astrophysical Objects," Fred C. Adams and Gregory Laughlin, *Reviews of Modern Physics* (1997).

"It ain't over till it's over."
—Yogi Berra

Jimmy Dyson pushed his bicycle through the sun-baked field behind Benny Krauss's house, spraying clouds of dandelion seeds into the air and jostling the precious cargo in the basket mounted on the handlebars. Withered thistles caught on the scratchy wool socks his mom always made him wear, even in the St. Louis summer.

"Benny, it came yesterday!" Jimmy shouted, lifting a brick-red box from the basket and waving it in the air. "It has Bob Gibson on the cover!"

Benny burst out the back door and sprinted to the bike, trailing plumes of dust from under his sneakers. "Lemme see," he said, prying the box from Jimmy's hands. "'Strategy-League Baseball, more accurate than the real thing.' Wow! Let's try it, Jimmy."

Benny pushed open the back door, blasting cold air into Jimmy's face. "Come on in," said Benny. "My dad says we don't own the electric company. You want some lemonade? My mom just made some."

"Sure."

Benny and Jimmy paused in the kitchen just long enough to gulp down the lemonade. Benny's mom never put in enough sugar, but the ice-cold liquid felt good in Jimmy's parched throat.

"You missed the Scout meeting last night," said Benny.

"Oh, Benny, we're getting too old for Boy Scouts. Besides, I wanted to read the rules for the game."

"Well, you missed a cool meeting." Benny crunched an ice cube between his teeth. "They had this astronomy guy from St. Louis U. talking about the Big Bang. No one knows if the universe is going to keep expanding forever, or shrink back down in a zillion years"—Benny dug his right fist into his left palm—"and squish us all like bugs."

"Hah," said Jimmy, "like that's ever gonna matter to us. Come on, you said

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you wanted to play the game."

The two friends plopped down on the avocado shag carpet in Benny's bedroom. Jimmy lifted the cover, which pulled off the box with a sucking groan. A stack of colored charts slid onto the carpet.

"OK," said Jimmy, lifting one of the charts, "Here's how you play. These are the players from the 1968 season."

"But it's 1969."

"Well geez, Benny, you can't make a game about the season if it isn't finished yet." Jimmy picked up one of the charts. "Let's say that I've got the Cardinals and you've got the Mets—"

"But I want to be the Cardinals!"

"Okay, okay, you've got the Cardinals and I've got the Mets, and Bob Gibson is pitching to Ron Swoboda. So this is Gibson's pitching chart. You roll these four dice." Jimmy passed the dice to Benny, who tossed them into the upturned box lid. Rattle, rattle—clunk. "So we read off of his chart, and it says the pitch is high and inside. Then you roll the dice again." Rattle, rattle—clunk. "This gives the pitch velocity. It's 97 miles an hour."

"Do you get to bat now?" asked Benny.

"Wait, I forgot to roll for the temperature and humidity. You do that before the game starts." Rattle, rattle—clunk. "Oh, gotta do the wind speed and direction, too." Rattle, rattle—clunk. "Now I roll the dice and check Ron Swoboda's chart."

Jimmy rolled the dice, and Benny squinted at the tiny print on the chart. "What does g(s)3b+2-1 mean?"

"All right," said Jimmy, "that means it's a ground ball, hit slowly, two squares to the right of third base, and one square in front of it. So now we have to find the fielding chart for the third baseman—that'd be Mike Shannon."

Strategy-League Baseball was indeed "more accurate than the real thing." It also took twice as long. After playing a couple of games, the two friends embarked upon a project with the foolhardy single-mindedness that only 14-year-old boys can muster: they would recreate the entire 1968 season, game by six-hour game. Every morning Jimmy would bicycle through the sticky heat to Benny's house, bounce across the field of weeds, and drag himself, puffing and sweating, into the cool sweet air of Benny's house. And there they would play until dinner time, when Jimmy would gather up his charts, carefully stack them all back into the box, and bicycle home in the late afternoon sunshine.

Strange things happened that season of 1968. Pete Rose fractured his skull on opening day and was out for the rest of the season—no batting championship for him. "Sudden" Sam McDowell pitched a nine-inning perfect game, only to walk seven consecutive batters in the 10th and lose the game. Furious three-way pennant races opened up in both leagues. Benny and Jimmy ignored the real baseball season that summer of 1969—the Cardinals were out of contention, so it looked to be a very unmemorable season. They buried themselves in the game instead. That summer, that last summer before high school, the last summer of childhood, stretched before them like an infinite ocean of time.

But even eighth-grade summers come to an end. The days grew shorter, and Jimmy found himself bicycling home in hazy twilight. By the time new school supplies piled up in Benny's bedroom, the two boys had only made it to the end of May on the baseball schedule. Jimmy went off to the big Jesuit high school downtown, while Benny attended the local public school in the suburbs. They still saw each other over the summers that followed, but Jimmy's lawn-mowing job kept him pretty busy, and after Benny went up East to college, they rarely saw each other at all.

"So Ben, what have you been up to?" asked Jim, bouncing three-year old Evan on his knee, while Laura cleared the dishes from the dinner table. "We haven't seen you in, how long, two

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years?"

"Been pretty busy at work," said Ben, settling into a frayed armchair. "It took a long time to set up the Neuro-AI Institute, and I've got to write grant proposals every year just to keep it going. MIT loves us, but they don't give us much money."

"But what do you actually *do* there? Laura keeps asking me what you do, and I just say, 'Oh, Ben's gonna put a computer in all of our brains some day.'"

Ben chuckled. "Just the opposite. We're going to imprint the neural patterns of the brain onto a computer, once we get the spintronic stuff going. Immortality! But that's decades away, too late for you and me." Ben glanced at Evan as he slid off of Jim's knee and padded over to Laura in his Winnie the Pooh pajamas. "But what about you, Jim? What have you been up to?"

Jim shrugged. "The usual. Teaching chemistry to high school kids who couldn't care less. I can't even get them to watch science shows on TV. Like that *Nova* special last week. They've discovered that the universe is filled with something called dark energy—"

"—which makes the universe accelerate as it expands forever," said Ben. "That's been known for a few years."

"Oh." Jim sat silently for a moment. "We took Evan to a Cardinals game last night. Hey, that reminds me, I want to show you something." Jim eased his wiry frame off of the couch and rummaged through the hall closet, spilling a fur-ball of coats into the hall. "Here," he said, pulling out a faded red box. "Do you remember this? Strategy-League Baseball."

Ben smiled. "How could I forget? 'More accurate than the real thing.' Also took a lot longer to play than the real thing, if I remember correctly. I'm amazed you saved it all these years."

"Better than that; I saved all of the records, the box scores, everything. Our last game was May 23, 1968, Los Angeles vs. St. Louis. That was a great game, Don Drysdale pitching against Steve Carlton."

"Didn't it end with a home run or something?"

Jim jabbed his index finger at a yellowed sheet of lined paper, which crackled when he touched it. "It's right here. Dal Maxvill hit a homer in the bottom of the 12th. The only home run he hit all season, or at least as far as we got in the season."

"Gosh, I'm amazed you still remember that. I'm amazed that *I* still remember it."

"Hey, do you have some time right now? Let's do another game." Jim leafed through the charts. "The next game is May 24, the Giants against the Cubs in Wrigley Field."

"Oh, Jim, I can't."

"Juan Marichal is pitching. And it's Wrigley field. Let's at least roll for the wind speed."

"I'd love to, but I've got an early flight back to Boston tomorrow. I'm giving a seminar at Harvard." Ben sidled toward the door. "Maybe next time I visit."

"Sure, let's plan on it." Jim walked Ben to his car in the muggy twilight through a sea of flickering lightning bugs. Then he went back inside to the game and pulled out the box scores for May 23, 1968. Jim shook his head sadly. "But Juan Marichal was pitching."

* * *

Jim Dyson dragged himself up the hospital steps, wheezing and stopping every three steps to catch his breath. Each time he put weight on his left leg, his knee burned like someone had driven a hot knife under the kneecap. At least the knee pain took his mind off of his constant backache. What was the point of living to 94 if you felt like death warmed over? But damned if he was going to discarnate until Laura did.

He finally found the room where Ben Krauss lay stretched out on a bed, his skin like wet paper, his breathing slow and irregular. A group of neuro-techs surrounded his body. Could these kids really be doctors? One of them, a Japanese woman who looked younger than Jim's grandchildren, was sliding a helix of cop-

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per tubing around Ben's shaved head. A bearded neuro-tech broke out of the crowd to intercept Jim.

"Can you save him?" rasped Jim. "You know, he helped to invent the damn process." Jim tried to push past the bearded neuro-tech to see his friend, but he might as well have been pushing against a wall. He slipped and fell to his knees. Tears welled up in his eyes.

The neuro-tech pulled him to his feet. "Look, old man, we're doing our best here. Everything depends on how long he's been brain-dead. I think you'd better sit down in the waiting room." He guided Jim gently, but firmly, out of the room.

Buried in a salt plug half a mile under a pine forest in the uplands of Louisiana, a three-meter cube of layered gold and silicon stored an array of spintronic processors, computing at the atomic level. Semi-sentient robots tended the square mile of land surrounding the salt dome, vaporizing any animals that blundered across the perimeter. No point in taking chances with 20 billion lives.

Jim Dyson lay on his stomach on an inflatable rubber mat in a Florida swimming pool, his body twenty years old, with some minor improvements on the original. He sniffed the chlorine and rubber and coconut-scented suntan lotion. Something about the sense of smell was vital to Jim—it was the most primal of the senses, the one that reminded him best of what it was like to have a body.

Laura floated three feet above the water next to him. She never worried about obeying the laws of physics, which always bothered Jim—it broke the illusion. She sipped a gin and tonic, gradually allowing intoxication to seep into her processing core.

"Laura, I'm bored."

"Get a drink," she said. "You want a Bloody Mary? Those were always your favorite."

"I need to find a hobby or something."

Laura pivoted ninety degrees, until her feet were straight up in the air, and her head was only inches above Jim's. "Tee hee, the world is upside down," she said. "What happened to that bridge club you belonged to?"

"We broke up. We played through all possible bridge games—there's only a finite number."

"Chess?"

"Chess was solved by the global processor. There's a perfect winning strategy for white."

"Then go see your friends. Or take up serious drinking, like me." Laura disappeared, along with the pool.

Jim interpolated himself into Ben's agorasphere, which Ben had sculpted into a scientific lab. Ben, clad in a white lab coat, was bent over a book. Kind of silly, thought Jim. Ben never wore a lab coat before the discarnation. "Ben, haven't seen you in, how long?"

"About 10^{20} ticks, I think, give or take a few. What do you need, Jim? I'm kind of busy."

"With what? Last I heard, you were doing pure math."

"Did that for a while. Proved the Goldbach conjecture, a few other things. It's not really satisfying—hard to tell where your own mind leaves off and the global processor begins. But lately, I've found a new problem to work on." The ceiling over their heads irised open, revealing a velvet sky sprinkled with stars. The view expanded to show the Sun and inner planets. "Watch what happens now," said Ben. The Sun swelled, turning first orange, then blood-red, engulfing Mercury, Venus, and Earth. "In five billion years, the Sun will enter its red giant phase and incinerate us all."

"Five billion years? That's a long time."

"Not when you're planning to live forever. We can't afford to stay earthbound until the Sun fries the array. A group of us are working on ways around it. You're welcome to join us."

"No thanks. This was meant to be a social visit. Do you remember that baseball game we used to play?" Jim could sense the option to trigger embarrassment in

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his own core. He chose to ignore it. "Have you ever thought about, you know, trying it again?"

Ben bifurcated. One of him went back to the book, while the other continued the conversation. "That's kind of silly, Jim. You could process an entire season in a few billion ticks. Hell, you could process all possible seasons. Seems like a complete waste of time to me."

"Yeah, I guess you're right." Jim flicked back to the pool. Maybe he would take up serious drinking after all.

All across the galaxy, the stars were burning out. First to die were the supergiants, prodigious wasters of nuclear fuel. Then came the yellow and orange main-sequence stars. Now the galaxy glowed brick-red with the dull light of billions of brown dwarfs, eking out an existence at the bare edge of exothermia.

James squirted a jet of hydrogen from the accretion disk around his black hole, slowing to orbit a familiar neutron star. Part of his consciousness was embedded in the magnetic fields threading the accretion disk, but the bulk resided in the black hole itself—a perfectly efficient quantum computer, once you learned how to tunnel through the event horizon.

"Anybody there?" he broadcast across a dozen wavelengths.

A modulated gravitational wave shot back from the neutron star, washing across the accretion disk, twisting space and time. "Who wants to know?"

"This is James Dyson. I came back to see you, Benjamin."

"James! How long has it been? And where's Laura?"

"Laura dissolved her own personality back before the Fifth Migration." James paused. Should he allow emotional content into his core? He decided to permit it—a sting of pain and emptiness. "She ran out of things that interested her. I think she died of boredom."

"Boredom? That's crazy. How could anyone be bored when there's such an important job to do?"

James broadcast an emotilog—confusion, dismay, loss of purpose.

"Look around you," returned Benjamin. "The stars are dying, and we're going to die with them."

"The brown dwarfs? They last practically forever."

"That's not what I'm talking about. The protons that they're made of—that we're all made of—they're unstable. They'll decay in about 10^{37} years, and then this will all dissolve—the stars, the gas, my neutron star, your black hole. But that doesn't mean we have to die. Consciousness is information and processing power. Maybe it can survive without matter. I'm sure as hell going to find out."

The universe ended as it began: in a soup of elementary particles. Electrons and positrons, neutrinos and antineutrinos, photons with billion-light-year wavelengths all swirled through the cosmos. Yet the end was different from the beginning. Subtle patterns coursed through the soup of particles—the patterns of consciousness.

James could feel the presence of his friend embedded in the local particle stream. "Benjamin, I sense distress."

"It's over, James. Everything I've ever worked for. The quest for immortality—it won't work. It's the damn dark energy."

"Huh?"

"The universe is accelerating. We've known that since before the discarnation. But it's driving information outside of the causal horizon. We *can* live forever, but the amount of information we can process is finite." The particle stream quivered. "Eventually, we'll just start repeating our experiences, over and over and over. What kind of immortality is that? It was always an illusion—we've never had an infinite amount of time."

"Really?" said James. "Well, in that case I have a suggestion."

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The two friends sat on hard benches in the shadow of a dugout under the midday sun. Raucous fans shouted from the bleachers behind ivy-covered walls. The Giants pitcher was warming up, hurling each pitch into the catcher's mitt with an audible thud. "Recognize this?" asked Jim.

"Hey," said Ben, "this is Wrigley Field!"

"Yep, Wrigley Field, May 24, 1968. Juan Marichal pitching against—who? Who're you going to start for Chicago?"

Ben squinted at his friend. "And what happens when the season's over? It won't last forever—we still have to face the end."

"True enough," said Jim. He smiled. "But through all of these eons, it was only during that summer of '69 that I really felt like I had all the time in the world."

Ben watched the team pennants above the center field scoreboard flap in the breeze. The wind was blowing out—good home run weather. "I had forgotten all about this," he mused.

"Just give it a try," said Jim, "for the sake of an old friendship that never quite died."

Ben smiled. "Okay," he said, "but I've got a better idea." The stadium vanished, and Benny lounged on his stomach on the soft avocado shag carpeting. "I think I'll go with Ken Holtzman," said Benny. "Everyone knows that Willie McCovey can't hit left-handed pitching. Hand me the charts for the Cubs." Jimmy tossed a stack of charts to Benny, and then leaned back against the wall to survey the Giants. The cold, dry air from the wall vent blew across their faces, and that summer, the long Indian summer of the universe, stretched before them like an infinite ocean of time. ■

Democracy is a form of government that gives every man a right to be his own oppressor.

—James Russell Lowell

Money is in some respects like fire; it is a very excellent servant, but a terrible master..

—P. T. Barnum

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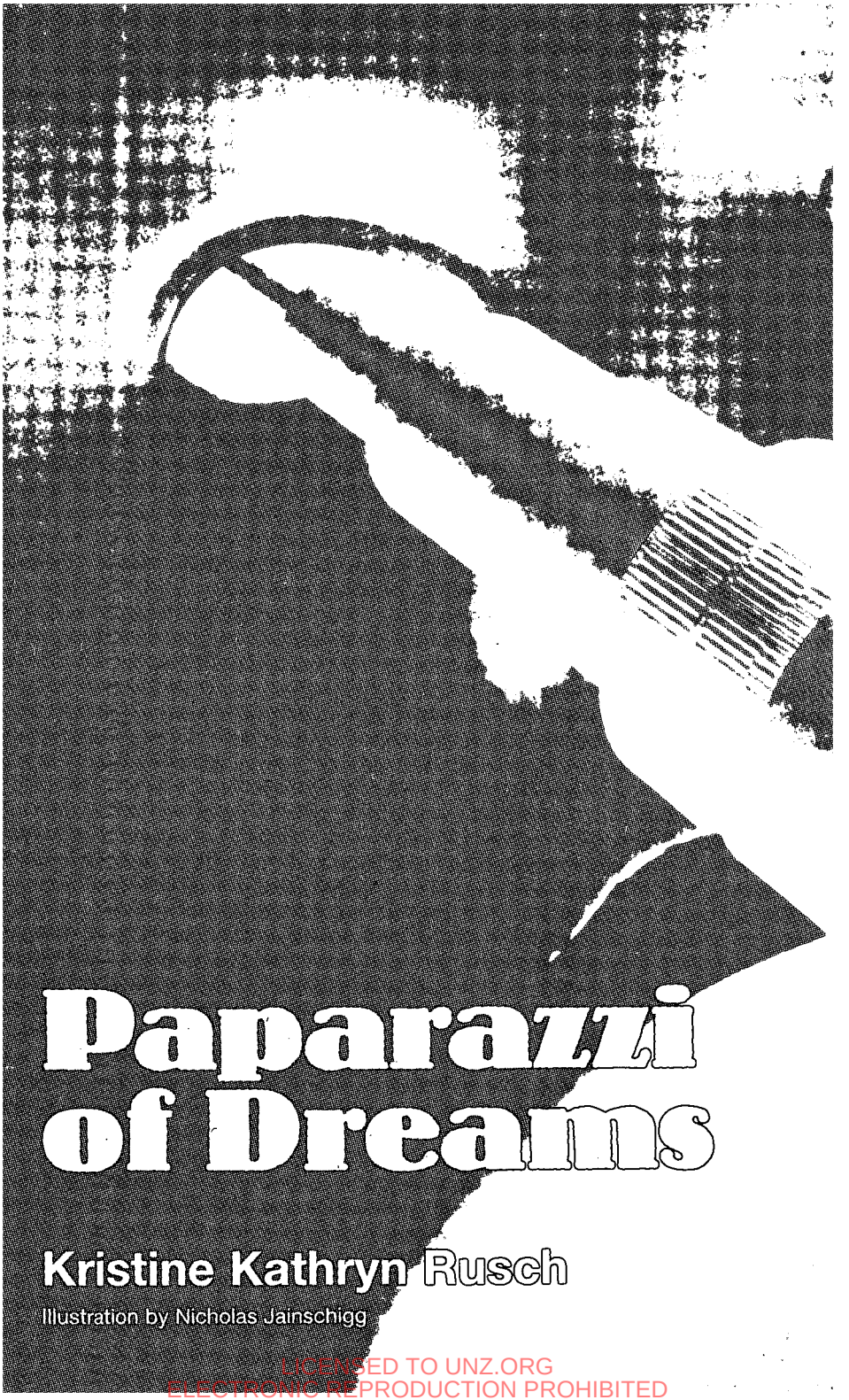

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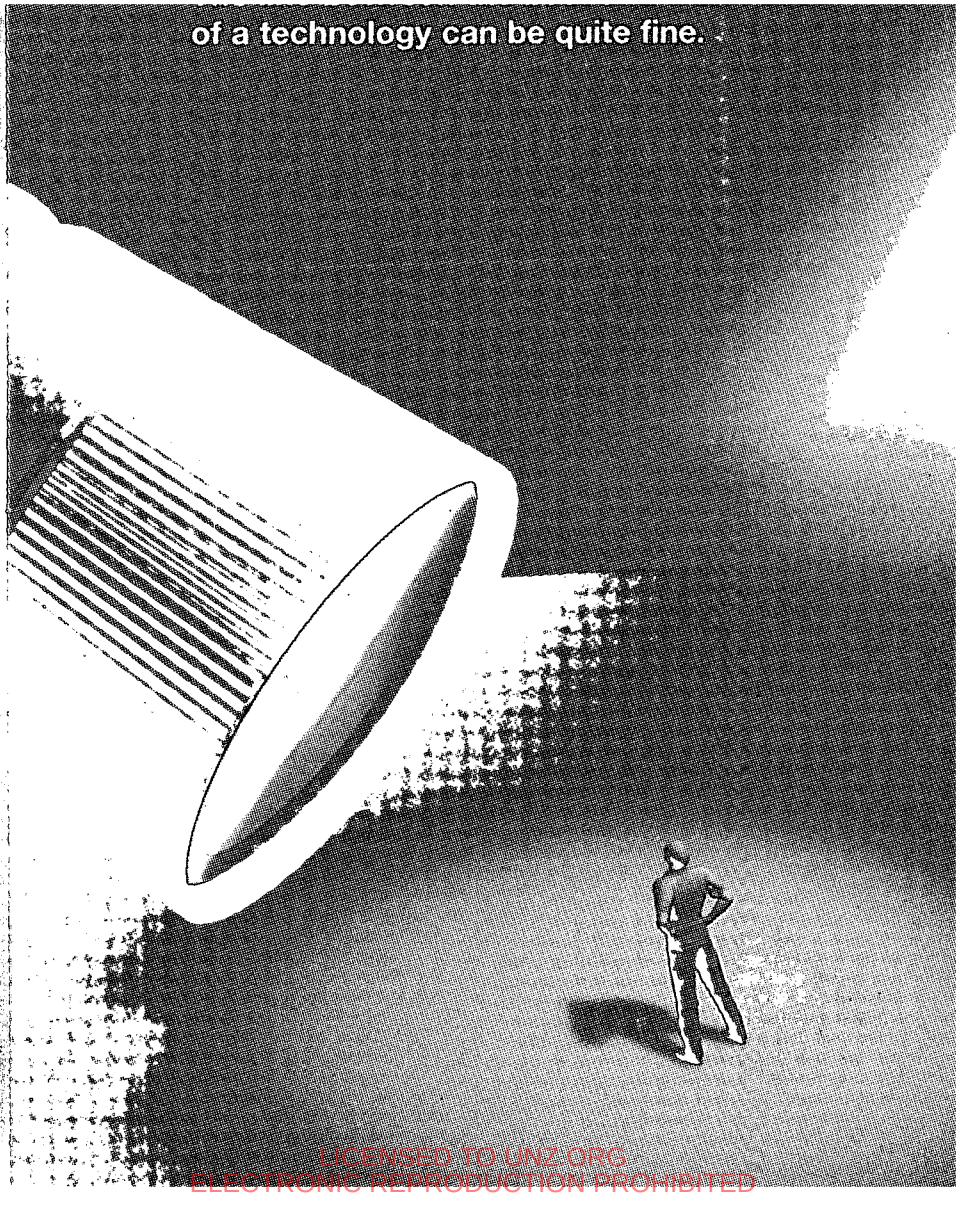
of a technology can be quite fine.



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least, that's how I'm playing it.

We're parked at the end of a dirt road just outside the gate. The guard hasn't seen us, won't come down even if he does. Just call the sheriff and we're off, gone before anyone gets here because we not only have a scanner, we have headquarters with their moles in the various law enforcement agencies all over the country monitoring every call.

Celebrityville USA. We're all so lucky that everyone wants a piece of the action.

"I mean," Morgana says, still fiddling with the focus. She's using the damn camera as a spyglass. "My dreams are just as crazed. Really. The last time I got Xavier, we get the standard naked-in-front-of-a-crowd thing. And you know, it's from his point of view, so except for that quick take at his johnson, we don't see much of anything—just crowd reaction and laughter, lots of laughter. Hell, I can have that dream on my own."

Not with a johnson, I think, but of course I don't say that. I keep my own counsel. Hell, I even keep my own name. I am undercover with the Dream Merchants. They all call me Max, and I've been here long enough to answer to it.

I bite my fingernail so that I don't give Morgana my first answer. The first answer would've been the honest one: if you think this is all such a crock, why the hell do you do it?

But I know why she does it. I've seen the money. I watch the kids buying this stuff, readily packaged by the mass-market conglomerates, the ones that used to sponsor magazines and stuff on glitz. Smart corporate execs—they figured out, once the dream technology became for the longest time—poorest state in the nation by the teens, lots of hunger, lots of need for work—desperate people don't talk much.

But in the last few years, the economy has turned around and word is getting out. Nur and Catherine with their palace on the Elbow; Sappho (stupid name, that) and Jenella in Yachats; and of course, Xavier—once Xavier and Lorita—with their very famous house just outside of Depoe Bay.

Lorita moved on to Cannes—what goes around comes around, they say, and what was hot will be again—but Xavier stayed after the divorce. Word is that she got the career, and he got the money, but for all her Oscars, he's still ranked number one at the box office.

And because of that, his dreams are worth almost as much as his pictures. More, if you count the price per second. Only he doesn't get automatic ownership. The dream has to be in a permanent form before that happens: recorded, copyrighted, registered.

That's where I come in.

Or at least, where I'm supposed to come in. My motorbike is parked inside the back of the van. We get the recording, I head to the nearest node, and I download the entire thing, along with the proper documentation, to the copyright office.

A few more of these, and I'll be trusted enough that no one'll double-check me. I'll be able to move up in the company, maybe even go into the private offices, view the records, see if anyone is breaking any real laws.

We try to shut these places down one by one, but it's hard. Mostly I'm gather-

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ing evidence for a creative artists' lobbying group, one that wants Congress to change the copyright laws to account for the changes in technology. My bosses want to make dream theft illegal: my job is to find ways to convince the politicians that it's worthwhile to buck the multi-billion dollar entertainment industry.

Morgana finally sets the camera down. She pushes the dispenser button on the coffeemaker in the dash. She fills her mug, then points to it. "You look like you need some."

I do, but I hate the generic crap she uses. In my car, which is currently residing in Jersey until I'm done with this stupid assignment, I have primo European beans, roasted to perfection and ground the moment I press dispense. Then boiling water shoots through the grounds, a shot of powdered milk (still can't keep the real stuff—there are limits to technology, even now), and a touch of sugar, and I have the perfect cup.

I miss it.

"You don't even seem thrilled that we're gonna get Xavier," Morgana says.

Oops. Mistake on my part. Rookies should always be slavering for the big celeb get.

"Xavier's been got before. You said so yourself just a few minutes ago."

"Yeah, but there's always the possibility we'll get the max dream, you know? The one that replays the split memories with him and Lorita, or maybe the one that mixes his real memories with some fantasy he's having."

"Everyone has dreams like that," I say.

"But not based in life. When you dream about Lorita, Max, you dream about the woman you've seen on the screen. When Xavier dreams of her, you know you're getting the woman he's seen and touched and tasted."

"Too bad dreams don't come in all five senses," I say.

Morgana blows on the mug, trying to cool the brew. It stinks of oil and cheap water. The beans smell old. "They're working it. They say within ten years, we'll be able to have it all—smells, touch, taste—everything."

Except that running commentary we sometimes get when we dream: that dialogue about the future or about your worries or about the way it actually feels to stand naked in front of a crowd.

Last time I had that dream, complete with my johnson looking as tired as it does in life, I was standing in front of sixteen refreshers at the detective agency that hires me out, trying to explain the intricacies of copyright law as it pertains to our clients.

I'm yammering about the differences between ownership of form versus the actual dream, and hoping that the class will understand how the law is always behind the technology, when I realize I'm cold. Not just any cold. Icebox cold. I look down—the famous johnson shot every man has in these dreams—and I don't think of covering it up.

Instead, I get someone to close a window. And then I go on. The class doesn't look; the class doesn't laugh. They're all taking notes, and as I call up the information they're typing on their PDAs, I see that the class is actually taking notes on what I say, not on what I look like.

And, I have to admit, there was a sense of disappointment I can still feel. A sense of disappointment that, if some paparazzi were stealing my dream through a telephoto attached to one of those special cameras, wouldn't come through. Some parts of dreams are still private—even now.

"Lights out." Ryan's voice sounds small and oddly rich through the digitized intercom on Morgana's busy dash.

Morgana hits the timer she glued to the edge of the steering wheel. The damn timer makes an actual ticking sound, like those antique clocks rich people like to keep in their living rooms.

I slip on my leather gloves, my heart starting to pound. The next fifteen minutes are crucial: Ryan can't get caught; he has to get the dream—there has to be

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a dream—and then he has to get back to us, before I can head off on the bike.

At least we're doing Xavier tonight. Pretty Xavier Calliende, so famous he's only known by one name. All of America—hell, all of the world—recognizes that five-five frame, that boyish face with its fashionable golden skin and smoky eyes. He's been dream-captured so much that even his sleep habits are well known. It only takes him five minutes from lights out to REM—hence Morgana's timer—and his dreams tend to rotate through pretty fast.

We only have time to wait through the first REM cycle: Much longer than that, and we're as close to getting caught as possible. Someday, Morgana wants to find a way to arrive and set up in the middle of the night: rumor has it that Xavier's best dreams happen before dawn, but the guards shift at that time, so there are twice as many people on the estate, making it nearly impossible to collect the pre-dawn REM.

The ticking continues. I slip on my bomber jacket, and adjust the collar so that the automatic helmet doesn't hit me in the neck when I activate the damn thing. Precisely ten minutes into the wait, I'll head to the bike—provided we get some kind of communication from Ryan.

Then I just wait—again—until he comes crashing through the bushes with his little prize.

Five minutes in, Morgana relaxes like she's the one dreaming. She sips the last of her crap coffee, then dispenses another cup, not offering me one this time. I won't have time to drink it if all goes to plan.

The oil-and-old-bean smell makes my stomach turn. Stakeouts were bad enough when I was a rookie detective on homicide. Then I quit, and joined a major D.C. detective agency, thinking that job might be more interesting.

It wasn't: mostly political stakeouts, trying to catch some politician in a controversial act. I jumped at the chance to work for the lobbying group.

They taught me that what companies like the Dream Merchants do isn't really illegal—not yet, anyway. The dreams are—to use the words of the damn techs—floating out there for anyone to pick up. Freedom of expression belongs to the person who codifies it, kinda like shouts heard at a rally.

Of course celebs control how their images are used, but here's the beauty of dream marketing: most of us don't see ourselves in our dreams. We're the protagonist, the point-of-view character, and there's no "image" involved.

It's all in the process of change, of course. Celebs are picketing Congress, and one or two of the senators have had their dreams stolen, so they know what a violation of privacy it really is.

The timer dings softly. Ten minutes.

Morgana looks at me, tilts her head slightly, her regal command to get my butt out of the car and on the way to the cycle.

"We don't know if he has something yet," I say, mostly because I hate these coastal nights, with their fog and damp chill and instant cold. It's July, for crissakes, and it's fifty-five degrees out there, if I'm lucky.

"Just get ready," she says. "I'll signal you."

I roll my eyes, ease the car door open, and wince as the fog seeps into the interior. I gotta ride in this stuff. I'll be happy when we move operations back to the City of Angels, where nights are seventy-five and balmy and I don't have to worry about sliding off some cliff in the foggy dark.

As I climb out, I hear Ryan's voice, all rich and velvety in the intercom. "Long REM. But I think I got the bulk. I'm seeing extra guards, so I'm heading out."

I push the door closed, careful not to let the latch make a telltale click. There aren't any guards near this part of the gate, but you can't be too careful. The last thing I want is to get caught—trespassing is still illegal, and we're within

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breathing range of that silly little crime.

I slink along the side of the car, crouching so that my head isn't visible above the roof. Dream Merchants know what they're doing; their vehicles are all camouflage-equipped. When the camo isn't on, this one is a dusky gray. But right now, the exterior is sliding from green to black, depending on the light.

My bike also has camo, and I almost can't see it along the car's back edge. But I feel for the handlebars, find them, and flick the dismount switch.

The level lowers the bike to the ground—the hydraulics almost silent in the evening air. In fact, aside from a few confused birds and ever-present shush-shush of the Pacific, I'm not catching much of anything. Even the highway is quiet, something that's mighty rare on 101 in the summer.

Then I hear it: the crunch of leaves, the heavy breathing, the snap of branches as they move back and forth. I climb on the bike's leather seat, touch the collar of my bomber jacket and duck as the automatic helmet curls out of the jacket's back and form-fits around my head.

I slide my fingers over the automatic controls, rev up the silent engine (which has always struck me as a contradiction in terms) and wait—yet again—holding my breath.

Through the glazed window, I see Morgana giving me a thumbs up, telling me what I already know. The great crashing sounds, the sobbing breaths, the creature looming through the forest that Xavier bought is Ryan, with the handful of guards coming right after him.

Ryan scales the fence like a monkey, the camera around his neck. He's skinny and barely twenty, and more athletic than he should be, given his diet of cappuccinos and pizza. He flips over the fence, and somehow manages to land on his feet, catlike.

He slides up next to me, hands me three discs—the important one no bigger than my thumb; the other two decoys in case the guards catch me—and hurries to the passenger side of the car.

I spin the bike out, heading down the gravel driveway as fast as I can. My wheels spit gravel and I long for a bigger windshield, but those, as my Dream Merchants bike trainer insisted, are for wimps. I hunch down, my head barely above the bars, and let the bike skid and slid its way to the highway.

The guards know where I'm going. Even though we're almost three decades into the new century, there's still only one artery on the Oregon Coastline, and that's Highway 101. The question is whether I'll go south or north.

If I were banking on me, and of course I'm not, I'd head north to Lincoln City and all the tech stuff that migrated over here fifteen years ago.

Instead, I hit 101 for all of five blocks, then cross the bridge in the center of Depoe Bay, heading toward the Coast Guard station, down in the World's Smallest Harbor. There's a government node there, one most people don't know about, and I'm gambling Xavier's guards fall into the most people category.

Soon as I reach the Coast Guard station, I'm off the bike, the helmet's gone, and the bike is stashed behind a Jeep Wrangler that has probably seen half a million miles. My bomber jacket is gone and I'm freezing my ass off, but I'm walking like a local—the sleeves of my sweatshirt pushed up, my thumbs hooked in the pockets of my jeans like this is any old night.

I get to the node, punch in the all-express number for the Copyright Office, add Dream Merchants' privacy code, and download the raw REM from Xavier, along with the date and my employee code.

Xavier, still warm in his bed, probably dreaming of Lorita like half of America, doesn't realize that the dreams he probably can't even remember—the starter dreams that his brain first cycled out just after midnight—are now the property of Dream Merchants.

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And, if those dreams are any good, they'll be uploaded before Xavier begins his rumored main dream cycle at dawn.

The team picks me up in front of the Sea Hag, the oldest restaurant in this tiny burg. I walked up from the Coast Guard station. Morgana drives back down, louvers the bike onto the back of the car, and we head to the condo Dream Merchants is paying for just north of the city.

The views are spectacular, even in the middle of the night. The ocean has a kind of glow, some of which is reflected light from nearby hotels. The rest comes from the stars—the real ones— and the moon and the ocean's general ambience, all white foam and violent water.

It's way too back-to-nature for me.

I'm the last one into the condo, after spending a few minutes on the balcony, watching the guards drive aimlessly back and forth searching for a green-black car or a single-rider motorcycle. One sheriff's vehicle got added to the search but didn't do much. Some wag on the police scanner opined that we were halfway to Portland by now—showing no one completely understood the operation, which Morgana took to be a good thing.

Soon the whole search will be called off. Law enforcement can't do much—they haven't witnessed the so-called trespassing, after all—and the guards do have a duty to Xavier: they can't leave his place vulnerable all night.

By the time I go inside, Morgana has the gas fireplace on high, the windows shaded and the radio beside the door on so loud you'd think she hasn't yet reached her sixteenth birthday.

She and Ryan are huddled in what passes for the living room—a high-ceilinged narrow room with floor-to-ceiling windows and the hardest sofa I've ever had the misfortune to sit in. Fortunately, Ryan's hogging it, so I have to bring one of the kitchen chairs into the room.

Morgana's tweaking the download, trying to get high rez enhancement, going for vivid colors—a hallmark of Xavier dreams, as opposed to dreams posing as Xavier dreams. In addition to being one of the biggest stars in the world, Xavier's one of those minority of people who dream in colors so vivid Jackson Pollack would have been jealous—if he were alive, dreaming, and trying to make a fortune off the uncensored images in his head.

"Mostly fragments," Morgana says, spitting the words, as if it's Ryan's fault that Xavier's most recent dreams had no logical consistency. Fragments can be sold as individual images, but they don't command the prices that the full-story dreams do.

A few vendors arrange the fragments like they are a dream, but the fans catch onto that trick pretty quickly, and often avoid repeat visits to those sites. So Morgana's under strict orders to find linked images first and foremost.

Ryan puts his hands behind his head and stretches out on that uncomfortable couch. He watches the get, unconcerned by Morgana's tone.

"Finally," she says, as the images bump and settle into something passing for an actual dream.

I lean forward, interested in spite of myself.

Xavier's dream starts mundanely enough: Our Point of View Character—obviously Xavier himself—is sitting on an embankment in the middle of a filthy downtown. Takes me a minute to realize we're in Chicago about twenty years ago, before Xavier is Xavier, and before I'm even old enough to vote.

Xavier's wearing torn blue jeans and scuffed Nikes, and they don't look like the uniform of the day. They look like the best he's got. He's breathing hard, sifting embankment dirt through his grimy fingers like he's looking for something or waiting for someone and needs something to do with his hands.

Then the image focuses on those hands and what I take for grime is actu-

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ally blood. Above him, an L train clankety-clanks by, and the embankment is gone. We're down in the Loop in the days before the L got upgraded to bullet train, back when the tracks were rusted and made of a thick metal that came from the middle of the previous century.

Xavier's got a girl pressed up against the staircase, and they seem to be alone. She's begging him, and I realize after a second that she's not begging him to touch her like most women would nowadays, she's begging him to let her go. Her breath is pretty raspy and her eyes are awful big, glassy—not with drugs or lack of sleep, but actual pain.

Then I recognize his grunts, and know what he's doing and a tear squeezes out of her left eye as she turns her face away.

The moment after he finishes, he zips up—the sound almost the only thing in that surreal scene—then she shoves him, hard, so that he stumbles backwards.

But he recovers, pushing her back, and she slams into the wrought iron steps. He grabs her, shoves her again, and again, until her head doesn't look female any more. Blood's spattering, more blood than would ever be at that kind of crime scene. The streets just run with it. He slaps her again and suddenly Morgana's fast-forwarding.

"What the hell're you doing?" I ask before I realize that I probably shouldn't speak.

"Seeing if there's anything good here," she says.

"That's not classic," I say. "It's not the long-empty-hallway dream or the falling dream or your basic wet dream. It's—"

"A goddamn rerun," Morgana says. "He has this thing damn near once a week, and it's fucking useless. Ice Cream Dreams has owned this thing for ten years, and it's practically the same frame for frame. It's one of his repeaters, and it isn't even very popular. It's just somewhere that his brain stutters to with too much regularity, and not enough variation to make it worthwhile for the rest of us."

The dream ends with the rivers of blood flowing into Lake Michigan. This image goes on for what seems like forever, or maybe it only does because Morgana is fast-forwarding. Hell, when Xavier dreams it, there might be some overlying commentary or music or maybe even screaming from the dead girl, but for the rest of us, watching an unenhanced dream, all we get is blood and silence.

Morgana slows the fast-forward down when we reach Xavier again, sitting on an embankment. Only this time, he's not beside the L. He's sitting on a tree-lined shore that leads into the blood-filled lake.

In the distance, little sailboats dot the horizon, white against the blue sky, a nice ironic counterpoint to the red water, and the blood on Xavier's hands.

I'm shaking. Ryan is asleep. Morgana is cursing under her breath. She sits even closer to the screen, studying it for some kind of difference and apparently not finding any.

The REM section ends with a few more fragments—floating faces, a bit of blood, a woman screaming as her eyes grow wide—and then it all ends.

Morgana freeze-frames the last image—the screaming woman—and curses again.

"A wasted night. I should be doing still photography for all the good this is doing me." She runs a hand through her hair and then snaps the screen off. "Fuck. You paid a fee on the copyright, didn't you, Max?"

"Following instructions," I say as laconically as I can manage. My heart is still racing from those dream images. He has that dream more than once a week? Has anyone tripped to the significance of that?

Morgana sighs. "At least it's unfiltered REM. We won't get in trouble for poaching on Ice Cream Dreams' material."

"It's the form," I say idly, and then wish I hadn't.

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Morgana swivels, focuses on me as if I'm the REM recording. "What?"

I'm supposed to be a rookie, someone who knows nothing. But I might have just blown that image. I try to recover as best I can by pretending I don't know that I said something I shouldn't even understand.

"That's what you're always harping on," I say. "The perfect form. That's the problem with the other dream factories, you say. They don't know how to make their forms work even when the dream-story is lame. So I figure the copyright office shouldn't care, right? It's just the form that's the problem, and we sent an unfiltered capture. It's bound to be different than the unfiltered capture sent by Ice Cream Dreams however long ago. And it's definitely different from the one they eventually started to sell."

Her gaze is sharp, measuring. She glances briefly at Ryan, but he snuffles, asleep, not even famous enough for either of us to grab his camera and record his dreams.

"You're learning awful fast," she says.

I shrug.

"I don't think I've ever had an assistant who learned this fast." That measuring gaze would've made me uncomfortable if I hadn't spent so many years as a cop, perfecting a gaze like that myself. Still, I'm not sure how to play it—as someone who does feel uneasy under a heavy stare, or as someone who doesn't.

After a moment, I say, "You make that sound like a bad thing."

Now it's Morgana's turn to shrug. "I can't figure you out, Max. You're not excited by the get. You find snuff dreams fascinating, and you understand form. You sure you didn't do this before? Maybe some illegal stuff? Porn? Underage vids? Teen wet dreams?"

I feel my shoulders relax. She's going the wrong direction with this. She thinks I've got more experience in the business than I let on, not that I'm undercover.

"No," I say. "But I don't think this is rocket science."

She laughs, picks up the equipment, and pops the get out of the machine.

"Still," I say, "that dream is fascinating."

"Worthless." She picks up the equipment. "He's going to be in this burg for a few more days, but I'm not sure I want to waste any more time on him. Maybe Xavier's passé."

"Maybe for you," I say, "but have you considered what the dream means?"

"Oh, don't get all creepy weird on me, Max. I like you. I thought you were level-headed." She stuffs the get into a nearby bag, then shoves the screen against the wall. She gets on the love seat, and stares at the fake fire, ignoring the very real ocean, which is visible in the window next to her.

"I am level-headed," I say. "I thought you were too."

She frowns at me, then glances at Ryan. He snorts again, deep in some REM sleep of his own.

"What are you getting at?" she asks.

"You said it a minute ago," I say. "You make money off celebs. That's your job, right? A kind of paparazzi of dreams."

"Hell, I used to be the real thing," she says, like being any kind of paparazzi at all is a respectable job.

"And if you're like me, you contract with Dream Merchants on a per-job basis because it's not worth their while to have anyone on staff, particularly if the gets fade or go a different way."

She's watching me now as closely as she had a few moments ago, but this time her dark eyes are avid. She's hearing money talk, which appeals to her.

"So?" she says.

"So, I assume you've studied dream theory?"

"It's crap," she says. "Who cares if flying is a sex dream or going through a damn tunnel is a metaphor for the penis entering the vagina?"

"That's not what I'm talking about," I say. "That *is* crap. I'm talking about the real stuff, the stuff they've figured out that's like real science."

She crosses her arms. "What? That

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everyone dreams? That you don't live long if you don't dream? That images change from culture-to-culture, but remain the same if you were brought up in the same tradition? Yeah, I got all that and it's worth about as much as the air I just used to tell you about it."

"You missed one," I say.

She sighs. Morgana likes to play games, but hates it when other people do. "What?"

"Repeated dreams," I say.

"Stress- or guilt-related, or maybe building on some other kind of emotion." Her voice is flat like she's reciting from a textbook. "Happens when the dreamer is feeling that emotion and the brain believes that emotion needs to be relieved, which is why most of these things are stress dreams. However, Xavier's main stress dream is one where he walks into a studio for a big movie, and they tell him they gave the part to some two-bit newcomer, and he can just leave. Or, the variation is that he is already acting in the role, asking everyone if he's good enough, and finally, they tell him no, he's not, and then the two-bit newcomer takes his place."

"I'm not talking about Xavier or stress dreams," I say, which isn't entirely true. I am talking about Xavier, and maybe I should shut up. Maybe I should just let this one go. It's my old cop instincts, the ones that gave me my own personal stress dream—walking up to a crime scene, seeing the perp pull the crime off, and trying to stop him, only to find myself wrapped in plastic, unable to move. "I'm talking about memories."

"Fuck." Morgana leans back in her chair. "You had me going for a minute there."

"Huh?"

"You can't prove someone else's dream is a memory," she says.

"Sure you can," I say, "and they've done it, repeatedly, particularly with famous folks. Since a lot of these people became famous due to a single—often traumatic—event."

Maybe this is cop work. Maybe I am giving myself away. But there's a part of me that really doesn't care. This work is impersonal and it does burn you out. Or maybe I'm just a bit disgusted at my own reaction to the dream, that hint of excitement I felt, as if I really did understand the get and the high it gives.

"You're talking about survivors of accidents and stuff?" Morgana asks.

I have her attention now.

"Movie-of-the-week kinda people?" she asks.

"Yeah," I say.

"I don't work that low," she says. "I don't think I've even thought of getting a get from the fifteen-minutes-of-fame folks."

It's my turn to sigh. She's more familiar with Xavier than I am, and I'm intrigued enough to need information. Only I have to go at it as if I'm not, as if we're two people sitting in a car, waiting for someone else to record the dreams of yet another person.

"I don't care how low you work," I say, because in my book, it's pretty low even now. "I'm talking about a studied phenomenon. They've realized with those people that they'll relive the trauma in their dreams over and over and over again. Usually detail for detail."

"Like a repeat." Her plucked brows come together. She bites her lower lip, obviously thinking.

"You say Xavier has that dream every week?" I lean forward on my chair, brace my elbows on my knees, and look at her.

She doesn't move—at least not much. If nothing else, her eyes get narrower. "Yeah."

"So maybe it's more than a repeat. Maybe it's a memory."

"Of a film role?" she asks.

"Maybe," I say. "I don't watch his movies. I wouldn't know a damn thing about him if he weren't a get."

"Started modeling, hired off the street back about eighteen years ago, when some talent agency was looking for 'the real thing,' not some generic pretty boy.

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Gets an agent and a manager, makes some real money, they find him bit parts, the camera loves him, and he has one of those break-through teen idol movies—"

"*Heartbeat*," I say, because I do know something about him, and because that movie was impossible to avoid. Just like the post-*Heartbeat* publicity when he falls in love with his leading lady, Lorita, who had already had two Hollywood marriages behind her, and this one—she says at the time—is the one that's gonna last.

Of course it doesn't. But by then, Xavier's on the map, and he's got some kind of golden touch, something that makes him choose the movies that connect with a generation. You name the best movies of the last ten years, and Xavier's been in most of them.

"*Heartbeat*," Morgana says, shaking her head. "The damn thing still holds up."

As if it's a century old instead of a decade. But, I suppose, if you live day-to-day, the way she does, a decade does feel like a hundred years.

"Hell," she says, "if you don't know what happened after that, then what in God's name are you doing in this job?"

"I know what happened," I say. "I just haven't seen any of his films."

Partial lie. I don't remember the ones I have seen. I catch them late night, and realize about halfway through that I have watched the damn thing before, and it's such fluff that it made no impression at all.

"Consequently," I say, "I don't know if those dream images we just watched are from some movie."

Morgana raises her eyebrows. "Our Hero Xavier raping and murdering a girl? He didn't even do that in *Double Double* where he plays both the protag and the villain."

"Not even the early stuff?" I ask.

"Maybe the modeling," she says. "But I had to go back through the shoots once, and I don't remember anything violent. They used him for the clean stuff, you know, aftershave and clothing and cars. Nothing that would appeal to the rougher crowd."

And as she says this last, her voice slows down. She's figuring it out.

My heart is pounding, and my breathing's a little ragged, and that makes me uncomfortable. I'm not sure I like how I'm thinking, so I ignore it.

Ryan, thank God, is still snoring on the couch.

"You think this might have actually happened?" Morgana asks, finally. "You think Xavier might have raped and murdered some girl?"

"Two points to the lady," I say.

"Shit." She stands up, unable to sit with the idea. She paces to the screen, then grabs Ryan's souped-up camera, staring at it, thinking about the images it stole out of thin air. I'm staring at it too, wondering why I'm so hyped, and basically knowing even though I don't want to.

The cop's get: solving an unsolved. But I'm not a cop any more, and I'm not interested in that get. I'm working government and business now, protecting creativity and creative minds all over the country.

Yeah, right.

"Shit," she says again. "That's like combining the old and the new."

"Huh?"

She threw me with that one. I don't know what she's talking about. Then she crooks her finger at me, leads me out of the condo's living room away from snoring Ryan.

We go into the first bedroom, then beyond, into the square box that passes for a kitchen. She grabs a Diet Coke out of the fridge and sits at the table, opens a window so that we get ocean noise, and taps her fingernails on the can.

"Old and new," she says, "the ultimate get. You know, the dreams that aren't dreams but memories. The memories that expose a celeb in a way that's sensationalistic, breaking an exposé that'll be everyone else's get for a week, maybe even months. It's got everything, Max."

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Okay, so she is ahead of me.

"Everything?" I ask.

"You gotta know the history of celebrity. It's full of crimes of the century, trials of the century, ruined careers, and tabloids, tabloids, tabloids. Then we get TV, and tabloid shows. Then the internet comes along, and the tabloids become hourly, you know, the get of the gets. The dreams, they're just a high-paying version of the photograph—the chopper over the wedding stuff—but they don't pay the way a sensational get does, particularly if you're the one who breaks it and controls the information."

Her face is flushed. I've never seen her so thrilled.

"You don't just control the flow, eventually you become part of the story. Book deals, movies of your own —"

"And you become one of those fifteen-minutes-of-famers," I say, trying to keep myself calm.

"If you're bad at it, sure," she says. "Or it's the get of a lifetime, and you make a career out of it, you become the expert on dream memories or subconscious crimes or whatever. You become the go-to person. See, that's part of the history of celebrity, too. The Louella Parsons, and Walter Winchell, and Barbara Walters and the goddamn tears, and *Entertainment Tonight* and Sanford Cooper and all those folks. They started with a major get, and they parlayed that get into a career of gets."

"The second-tier celebrity," I say, using another of her terms.

"Shit, no," she says. "The celebrity journalist. A lot of these folks—Hedda Hopper, Liz Smith—they're not just chasing the get, they *create* it. In her day, Hopper was the one who used her influence to create the celebrities or destroy them."

"Power," I whisper.

And Morgana smiles. "Now you're getting it, Max."

"All from one possible murder," I say.

"A celeb murder pre-fame," she says, "that no one's nailed down."

"And yet," I say, "it might only be a dream."

"Or a scene from a movie," she says.

"Or one of his fantasies," I say.

"Yuck," she says, as if her life and imagination are pure. She guzzles the Diet Coke. "You know, I got some money stashed, and I'm getting mighty tired of sitting in cars, waiting for some lame-o famous person's subconscious to vomit a storyline. Maybe we should chase these images."

"We?" I say, even though that was what I was initially going for. I thought I needed Morgana, but maybe not. I was going for the white-knight thing, solving a twenty-year old crime, but she's already made it something bigger—and something that intrigues me, against my better judgment.

"We, smart boy," she says. "You're the one who figured this out, so I assume you're the one who's done the reading on dreams and memory and crap. Besides, you like getting your hands dirty, all the background stuff. You told me that when I hired you and I remember thinking, 'Why the hell should I care?' Well, I care now, and it'll be really cool."

She turns things on me faster than I can imagine. I've never known anyone who controls the people around her like Morgana does. Usually I'm the one in charge, but in this case, it's her.

"What'll be cool?" I ask.

"The way we'll work together," Morgana says. "I'll head back to L.A. and dig up every image I can find of Xavier—even his goddamn baby pictures. You head off to—Where is that? D.C.?—and see if you can find the girl or what happened to her."

"It's Chicago," I say, wondering how she can miss the L or the lake. But places aren't Morgana's strong suit. People are.

"Fine," she says, "whatever. Blow into the Windy City and see if you can find this thing."

"Then what?" I ask.

"Then we break the get. We have the scoop of the century—or at least the decade. And it'll be news not just be-

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cause Mr. I-Can't-Make-An-Unpopular-Movie murdered his way to stardom, but also because we used new technology to catch him."

She grins at me, and I feel even more off-balance. I was sort-of thinking along those lines—the arresting of a movie star lines—when I started talking to her, but not about individual and personal fame. That's Morgana's thing, not mine.

"What if I can't find anything?" I ask.

She shrugs. "Hell, we just spent a fortune on a get that turned out to be a repeat. I figure if you're gone for a frickin' month, burning 10K a day in expenses, the losses won't be any greater than this one was."

I would never spend 10K a day, but I don't tell her that. If she's willing to use the expense account to send me to Chicago and keep me out of the waiting/motorcycle gig, I'm a happy man.

"That's what I got?" I say. "A month?"

"Babe, you got half a year if you bring in the get." She grins at me. I've never seen Morgana so pleased. She reaches across the table and cups my face with her hand. Her skin is cold from the Coke can. "You're something else."

"Yeah," I say, wondering what I've just gotten myself into. "I certainly am."

The nice thing about undercover is you don't have to report in weekly, even monthly. The rough thing about it is that when you're done, you have to justify each action, explain your reasons for doing each and every little thing.

I lie awake in my narrow bed in the smallest room of the condo, listening to the surf pound and the occasional truck go by on 101, wondering if I should resign from the agency. Because this really has nothing to do with stealing dreams and putting them into a form. If I'm right about the get (and I cringe, realizing Morgana's language has seeped into my brain), then this is about an actual old-fashioned crime—murder—not a new-fangled, hard-to-prove, maybe-not-ever a crime, like dream theft.

Morgana's already out of here, heading to Portland to catch the six A.M. back to L.A. My flight's two days from now, giving me time to close up the condo and explain to Ryan why he'll be working with a new team. Ryan'll be just as happy as the rest of us to blow this burg—celebs like tiny towns for the intimacy and illusion of privacy, but these places are hell on the rest of us.

I can hardly wait to get to the Windy City and use my real training—digging through old records, opening a cold case, seeing if a real-life murder actually happened some twenty years ago in the Loop.

I spend the next night in Portland at Powell's City of Books, the biggest bookstore in the U.S. for going on thirty years now, buying every single volume I can find on Xavier and his cronies. There are way too many of these things, and I'm not happy looking like some overage fanboy with too much time on his hands. I even buy a black City of Books book bag just so that I don't have to carry these things around in public.

Ryan's still in Depoe Bay, still in the condo, waiting for the new team. He says he wants to get the ultimate Xavier get—which, in Ryan's mind, is still that predawn dream—and he's willing to sit on that fence in the cold damp air every night for the rest of his life to achieve it.

The new team'll answer to him. He seems relieved that Morgana's gone, and he's never really even noticed me. He'll forget that we were even there two days from now.

Me, by the time I get on the plane to Chi-Town, I know more than I ever wanted to know about the publicist's version of Xavier Calliende's childhood, youth, and pre-fame days.

It seems like there's a template for actors, at least the successful ones: broken homes, a lot of siblings, need for attention, poor school behavior rescued by love of the theater, a gift for performance or comedy or music. Xavier had

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all three according to his early teachers, and then he fell in with the wrong crowd. He was living on the streets when his pretty face got him a modeling job—kind of the twenty-first-century version of getting discovered in a soda shop.

My cop self, reading between the lines, thinks no one noticed this kid until he suddenly ended up on the silver screen. The teachers hear his background, vaguely remember his face, look up their old class lists, and claim they remember him. He's tossed out of the house, heading down the drugs-and-alcohol path toward total ruin, most likely paying for his habits by turning tricks when one of those tricks actually looks at his face and realizes that this boy is a meal ticket.

I log on at thirty thousand feet, surf through the garbage on Xavier to the scandal sheets, figuring the tabloids that Morgana admires so much probably have the uncensored versions of Xavier's past—at least the stuff they dare publish without getting threats from Xavier's "people."

I find a lot of facts to confirm my guesses, along with some early names. I also search the old news wire databases for unsolved teen murders in Chicago, but get so many hits that I feel discouraged even before I start.

I log off, catch a few zzzs, startle awake when I realize that if I dream, anyone on the plane can peer into my brain. Not that I'm famous enough. Not that I'm interesting enough.

But this job has gotten to me, and that's when I realize how badly I need this break.

Chicago is an old-fashioned blue-collar town. Carl Sandburg called it the City with Big Shoulders, and not much has changed in the 100-plus years since he wrote that line. The people are blunt and hard-edged. They also come in all shapes and sizes, mostly a little overweight and a little underdressed.

Chicago reminds me how much I hate the world of celeb. All surface and glitter, all appearances and images—even the goddamn dreams. It's refreshing to hear someone curse me for grabbing a cab before they can; it's thrilling to have the clerk at the hotel treat me like I'm important rather than some nobody who's in town to view the stars; it's exhilarating to walk the streets and not scan passing people to see if they're someone I "know."

Once I'm inside my hotel room in one of the glitzy places on the north side of the river where, apparently, the money's always stayed since someone decided to settle in this swampland and call it a city. I am using the Dream Merchants expense account to live in comfort for the week—or months—that I'll be in the Second City, but I'm only using that account at the hotel.

The rest of the time Max has left the building. The rest of my time in Chicago will be as myself, Burton Kleeland, the former New York City policeman, here on assignment for my new job, working a cold case, tracking the background of a suspected criminal for a crime that happened decades ago. There won't be any mention of Xavier, or Dream Merchants or Hollywood. Only one dead girl, possibly raped and murdered, and left by the L for someone else to find.

It's amazing how easy it is to slip back into my old self. First thing I do is get rid of the Hollywood clothes—no jeans and ponytails and casual white shirt that somehow has to stay white. I clean off the fake tattoos and take out the earrings, glad I didn't get anything else pierced so that I looked like the middle-aged former metal-head I was supposed to be.

The secondhand stores in the Loop carried the rumpled clothes I needed to reclaim old Burt Kleeland. Jeans still—guys my age always wear jeans—but a suit jacket over them, an old suit jacket that has seen better days. A trench coat for the rain, and a shabby umbrella (same purpose). Button-down shirts for

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under the suit coat, and a few ties so that it looks like I'm trying to be serious about my job. I even get real shoes—the kind that have leather exteriors and look like they belonged to my father. I only plan to wear those when I have to flash my old badge at someone. The rest of the time I'm holding onto my Nikes.

Research in Chicago's a pleasant thing. This is a city that holds onto its history with big meaty fists. First, I go to the Chicago Cultural Center, a Romanesque building that had been built in the 1890s as the Chicago Public Library. The place smells cool and dry, probably a combination of the marble interior and the stone exterior, along with some sort of sophisticated air-conditioning system.

The Museum of Broadcasting lives in this place and while I like all the ancient television shows and the monuments to entertainers I've only seen on documentaries, I'm not in the mood to browse. What I want is the research center two floors up, manned by a disgruntled teenager and an elderly maven who spend their days handing out old-fashioned headphones for the old-fashioned equipment, and taking people's drivers licenses for the folks who want to work on the new equipment.

Me, I'm going for both. I want to see what Chicago thinks of its native son, Xavier Calliende. I want to see if the city's broadcast media recorded his meteoric rise to fame or jumped on the bandwagon afterwards.

And I want to use the scanning equipment for a few visual comparisons. They might cut some time off my work.

The cool quiet of the research library calms me quicker than a glass of wine. I haven't been in cool quiet for nearly a year. I've been alone with my own thoughts—all that damn waiting—but never looking at something that interests me, trying to figure out the past in the best way possible.

First I use the digital index to see what's in the archives about Xavier. I find the expected stuff—more recorded versions of *Entertainment Tonight* than anyone should be allowed to see; a few *Dateline: Entertainments*; and a lot of little movie-promotional feeds. Of course there's a *Biography* and all of the *Biography* rip-offs, as well as ancient, downloaded and perfectly preserved internet sites—as Morgana would say, little tiny pictures of a not-quite-real past.

I skip all of that. I'm looking for the local stuff, the stuff that often doesn't make it into the national consciousness. I want the Xavier only Chicago knows.

But after two hours of searching, it seems that the Xavier Chicago knows is the same one whom the rest of the world knows. My hunch about his past becomes even more real to me—Xavier was a nobody until somebody discovered him.

So I go back to the desk, hand them my driver's license and a fifty, and get the keycard for the image-comparison scanner. I also have to sign a waiver that I won't use this machine for nefarious purposes, and I must acknowledge that the Department of Homeland Security could be watching me at any time, worrying about the images I'm trying to compare. I could be a terrorist, after all—the bogeyman from my childhood.

I take the keycard and the little ID number the disgruntled teenager gave me and wander into the secondary research room. This one's smaller than the main one, partly because the equipment's smaller. The old stuff is big and bulky, desktop sized. The new stuff fits in the palm of my hand.

I have to sit out in the open to do my work, unlike the other sections of the research library. The equipment is so small that I might steal it if the old biddy and the boy aren't watching my every move. (I'm sure they're not, but illusions are always more powerful than reality, even in research libraries.)

I take the freeze-framed dream image of the girl, her face half-turned away from the protagonist's, a tear on her cheek, and plug it into the comparison

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scanner. It'll take a few minutes because I don't have a full-frame face.

I looked, of course. In fact, I searched for one. But even when Xavier's humping the girl, he's not really looking at her. Her face isn't quite there. It's almost like he couldn't quite remember her, and his brain wasn't willing to supply a new face in place of the old one.

The weird thing is, though, that the image of the tear-streaked half-turned face is so clear it's of photographic quality. If I were back on the old job, I could've used that face for a partial holographic 3-D reconstruct, and one of the forensic art and sculpt team could've used that partial to recreate the whole face.

I'd go to the Chicago Police Department and beg for help from their forensic unit if I have to, but until I do, I'm going to see what I can do on my own.

The little scanner in front of me beeps, then a printer next to me spits out two 8.5 x 11 single-spaced sheets of references with images that match this girl's face.

I grab the sheets as they emerge, my heart pounding. All the references are twenty years ago, just like we thought. But half of them are for a missing persons report. A quarter are news broadcasts from the same period. And the last quarter are a series of documentaries on the grisly and violent Loop Rapist—a man they caught literally red-handed.

Of course, I don't believe what I'm finding. Did Xavier pay off someone to take the fall for him? Was an innocent man accused? And worse, is Xavier Calliende, America's Favorite Action Hero, really the Loop Rapist?

A shiver runs through me that has nothing to do with the chilled recycled air.

I take my list and go back to the digitized index, checking out all of the news reports and two of the most reputable companies' documentaries. I also hang onto my keycard, just in case my scan is flawed.

But when I settle myself in the main room, in cubicles that were designed back in the late 1990s, and I plug my headphone into a jack that had been designed in the same period, I look at the image the biddy in the back has sent to my screen. (Patrons aren't allowed to touch the old videos and DVDs. We must give a reference number to the biddy, and then she puts everything into the machines. We poor peon patrons only get to watch.)

The image on my screen is high-quality reproduction of a missing poster, clearly designed by a loving family. A girl—what passed for an All-American Girl in my childhood—rounded cheeks, blue eyes, brownish blond hair and a fresh-faced smile—dominates the page. In one photograph, she's laughing and cuddling the All-American Dog—some kind of mid-sized mutt. In another, she's staring sideways at me, her hair done up, the background all foamy and pretty—a graduation photo.

And in the photo that matches Xavier's dream/memory vision, her face is turned sideways in the exact angle of the vision. She's looking at a friend who has been cut out of the photograph, and there are no tears on her cheeks. Her smile is soft and radiant, the kind of smile that girls get when they're in love.

I peer at the person the poster designers cut off: from what I can tell, it's not Xavier. All I have to go on is an arm, a shoulder, and a bit of hair. Hair changes color, but shoulders and arms have a certain sense of definition, and unless Xavier was really small and scrawny when he knew this girl, he isn't the guy in the photograph.

Then I look at the rest of the poster. It was clearly family-designed for an unexpectedly missing person. The girl's name was Holly Lescoe, and she was an honor student at one of the suburban high schools. She'd gone downtown to see a play with a friend, and neither girl had returned.

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The story, apparently, was major local news because of the Loop Rapist, and because Holly was the All-American Girl. If an innocent like Holly, beautiful and smart (her whiteness implied), could become a victim of the Loop Rapist, anyone could.

And sure enough, a few weeks later, the community's worst fears had come true. Holly Lescoe, All-American Girl, had washed up on the shores of Lake Michigan. She'd been beaten so badly that it took dental records to identify her, and after the autopsy, the medical examiner confirmed rape.

I watch the coverage, read through the files. The only thing that ties the victims of the Loop Rapist together was that they were in the Loop and they were female. Otherwise, they have nothing in common—not ethnicity, not age, not occupation or attitude. They vary from teenage girls to elderly women, and they all died brutally: raped, beaten, and tossed into the lake.

One afternoon, about a year after Holly Lescoe's body washed up, an off-duty police officer sees a man carrying a bundle toward the boat docks near Jackson Park. The man scurries past when he notices the cop watching him.

The cop follows him, notes that the bundle is dripping red, and gets close enough to realize that the man is covered in blood. That's when the off-duty cop calls for back up which miraculously arrives within five minutes, and they catch this guy, this Tony Knickerson, trying to dump a body into a boat. The boat's his, and the bottom is covered in guts and blood.

The guts belong to fish. The blood is human.

The physical evidence links Knickerson to all of the Loop Rapist killings. His semen is inside the bodies, his skin cells beneath several fingernails (apparently not washed away by that wily lake). Their blood is in his boat and on his clothes—since he never once tried to cover his tracks.

Tony Knickerson didn't even have a trial. He confessed as soon as he got inside and, in exchange for staying off death row, told the cops where to find more bodies. He went to prison for life.

I sit back in my chair, study all of the news footage before me—the girl whose face clearly belongs to Xavier's memory—and go over what I know.

I know that physical evidence of that magnitude is hard to fake. I also know that Xavier lived on the streets in those years. Literally on the streets, doing drugs and/or dealing them, possibly turning tricks. He probably saw lots of stuff he didn't want to see, lots of stuff he needed to forget.

Like the murder of Holly Lescoe?

That could as easily be a guilt dream as a memory dream. They are related, after all, and it would make some sense: he hadn't stepped in. He hadn't stopped the crime. He had seen it all, and he blamed himself.

I bite my lower lip as I consider: he saw her well enough to remember her face, remember the tears, but not well enough to see what she looked like during the rape. Had there been a period of time between? Had he tried to save her and failed?

Is Xavier Calliende's hero complex that simple? Is he a hero in his imagination and a failure in his life? Does he have to act that out on screen?

I don't know, and I'm not sure I care. I'm going to follow through on all of this, but it has lost its luster for me. Even if I can prove that Xavier saw the crime, I can't charge him with anything. All we have is a dream, after all. No clear evidence that he could have stopped the killer. No clear evidence that Xavier hadn't made Holly Lescoe cry on his own, so that when he heard of her death, he was able to put the pieces together.

Actors have vivid imaginations—that's part of the job.

It's a dead end, a blind alley, and all of those other tacky clichés. Still, it got me away from Dream Merchants for a short

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time—a much needed break so that I can go back undercover and try to get enough evidence to convince Congress to create a crime where, at the moment, there is none.

I stay in Chicago for a week longer than I need to. One full month on Dream Merchants' dime. Or their daily 10K as the case may be.

I figure I deserve it. Hell, thinking about celebs, all the waiting, the damn dirt of seeing into someone else's subconscious, is worth a 300K vacation, even if it is in a hot, sticky urban environment where I know no one.

I do a bit of work, of course. I look at the evidence—sure enough: it's complete, good, accurate, and well documented. The Chicago Police Department has had a bad reputation for years, but clearly, in this case, they wanted to put the Loop Rapist away forever, and no one made any mistakes.

Then I go back to the basics. I want to make sure that Xavier's path couldn't've crossed Holly Lescoe's and I discover that I'm the one who made a rookie mistake.

Their paths crossed. Their paths crossed major.

They grew up on the same block until Xavier ran away. They went to the same schools, they spent years together in the same rooms.

Maybe he saw her in the Loop that day, maybe he thought of going over to her, talking to her, but was ashamed.

Maybe he saw her with Knickerson, thought she had a boyfriend, and didn't want to bother her.

Or maybe she talked to him, tried to save him like girls of that age were wont to do, and he pushed her away—into the arms of Knickerson.

I have a hunch we'll never know. After all, Knickerson's a rapist and murderer: there ain't no trusting what he says. Holly Lescoe's dead. Her friend is still missing. And the only possible witness, Xavier Calliende, has so much to lose by even mentioning this case that he's probably tried to put the whole thing out of his mind.

Which is probably why it all lurks in his subconscious as a nightmare: one that ends with rivers of blood.

When I can finally face returning to Dream Merchants and the hunt for the get, I call Morgana. I'm in the fancy hotel, lying on my bed, imagining her in that cruddy car, in the cold, hitting the dispenser for the even cruddier coffee.

"Hey, dollface, it's Max," I say, donning a persona I'd rather forget. "Remember me?"

"Whatcha got for me?" she asks.

"First, tell me about the films and the modeling," I say.

She pauses. She hasn't expected me to take control of the phone call.

"Lots of pretty boy pictures. Some creepy stuff early on—a bit of Heroin Chic, I think—remember those perfume ads from the turn of the century? All those skinny people glomming onto each other in stick-like fashion?—I got those, but they're not rape imagery or anything. They're just gross."

"Nothing else?" I ask.

"Hey, I did a lot of research, especially for me. I even went back into his first agency's archives—after hours, of course."

"Of course," I say, knowing how it worked. She knows someone everywhere that's important. Her ability to move around a modeling agency after it closed is no surprise at all.

"I couldn't find a damn thing," she says. "So I have hopes for you."

"Well," I say, "it's a bust here too."

"You spent a month on a bust?" she asks.

"Yep," I say. "The girl exists, or did. She was the victim of the Loop Rapist. Remember him?"

"No," Morgana says, sounding bored. "I don't do true crime."

So I go into the whole song and dance, telling her the history of the

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Rapist, all about the evidence, and all the legwork I did. She's yawning a few times, and then she gets silent.

I think—I hope—she's fallen asleep.

Instead, midway through some explanation of DNA, she interrupts me. "Max?"

"What?" I try not to have relief in my voice. She's gonna tell me to shut up, which I will gladly do.

"Did you use an image scan to find the girl?"

"Yep," I say. "I used the tear-stained frame from Xavier's dream and —"

Too late, I realize Morgana's trapped me. I feel my face flush but I go gamely on, hoping she's dumber than she really is.

"—and used one of those research machines. It turned up a missing person poster. Must've been all over Chicago at the time. That's probably how he knew about her."

"C'mon, Max." Morgana isn't dumb. Dammit to hell. "He saw her, didn't he?"

So I tell her. I tell her everything. I remind her that the guy's blameless, that he won't talk for fear of jeopardizing his career, that if this were a true get, he probably would've sued to have the dream images removed from Ice Cream Dreams site.

She uh-uh and uh-has me, and I'm hoping I'm convincing her. I'm convincing me.

When I pause for breath, she says, "When are you coming back here?"

"Day after tomorrow," I say. "I'm booked on a flight out in the morning."

"Report to the L.A. office," she says. "I'm hearing stuff about Cosimo. He might be staying at the Four Seasons. I have a guy on the inside. If we can get the suite next door, we have a perfect get. Except that I'm going to need my best runner."

Me, on the goddamn bike.

I sigh. "I'll be there," I say, and hang up, feeling uneasy. Feeling like it's not over yet.

And of course it's not. By the time I get off the plane in L.A., the story's everywhere—mainstream media has picked it up.

Did Xavier Witness a Murder?

Did America's Greatest Action Hero Wimp Out?

Why Couldn't Xavier Save the Girl He Loved?

Talking heads are on the overhead screens in LAX, speculating on the meaning of the dream. The dream they're showing is the raw footage we got a month ago—and they attribute it to Dream Merchants.

They specifically attribute it to Morgana.

She's on the big screen in front of me, pontificating about guilt dreams, repeating the damn pop psychology I rattled at her.

"Maybe he's making these films because he wishes he had been a hero," she says, sounding every bit as oily Walter Winchell and Barbara Walters and Sanford Cooper.

She looks serious. She *sounds* serious. But I know those eyes—days of waiting in the cold make you really familiar with someone's eyes—and she's gloating. She's got the get of the decade, and she's on her way: the expert on the guilt dream as it applies to celebrity.

Another screen cuts away to Xavier, running from a limo to his house on the Oregon Coast. The camera catches his famous face, and because I, like the rest of America, am intimately familiar with all of his moods from his movies, I know what he's feeling:

Devastated.

His life will never be the same.

Because I sat in a fucking condo with a fake fire burning, looking at his subconscious dealing with something I really don't understand and thought I could have a get. A cop get, but a get all the same.

I stand in front of the giant screen, Morgana still talking, happy with her newfound power, and my stomach twists. We're no different after all. It's just

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different things that make us hot. She wants fame and the power to destroy. I want justice and the power to make things right.

Only I used my limited powers to help hers.

Mistake. Big mistake.

Her eyes—twenty sizes too large, and flat on the screen—sparkle. I can't go back to Dream Merchants. I can't see this woman ever again.

I turn around and head down the corridor toward ticketing. I'm going back to D.C.

I have a different get, one I didn't expect. Congress is full of people with gray areas in their subconscious. Repressed memories, stuffed-away good-time moments, buried actions-not-taken. Lots of guilt dreams in both Houses—and those guilt dreams are bipartisan.

If I can't convince those people to change the laws now, given the look on Xavier's face, given the wreck Morgana and I have just made of his life, then I'll never get the federal laws to change.

I'll have to travel state to state and find some other way to make this illegal. Ban the dreamcording cameras, ban the sale of other people's dreams, ban the sale of dreams altogether.

I'll figure it out. I'll go head-to-head with the entertainment lobby if I have to.

Because I do have to.

Or no one will ever be able to sleep soundly again. ■

IN TIMES TO COME

After the controversies unwittingly ignited a few months ago when *Analog* editorials made passing mention of Sports Utility Vehicles, it will be interesting to see what kinds of reactions we get to next month's lead novella, "Baby On Board." It comes to us from a writer new to our pages, Kenneth Brady, and has the somewhat unusual quality that most of its characters *are* SUVs—and I mean that quite literally. It also has the added virtues of being both thought-provoking and a lot of fun, no matter where you stand on that cluster of questions.

In a completely different vein, Mike Moscoe offers a seasonal tale that's also one of the more unusual stories of alien contact you're likely to read. We'll also have stories by such writers as John G. Hemry, Grey Rollins, Brenda Cooper, and relative newcomers Carl Frederick and Joe Schembrie.

Rounding out the issue is a fact article by Yoji Kondo and William A. Gaubatz about one of the less technical but nonetheless crucial problems of space exploration and utilization: focusing visions and goals. In general, to achieve any goal, you need to have a reasonably clear picture in mind of where you're trying to go!

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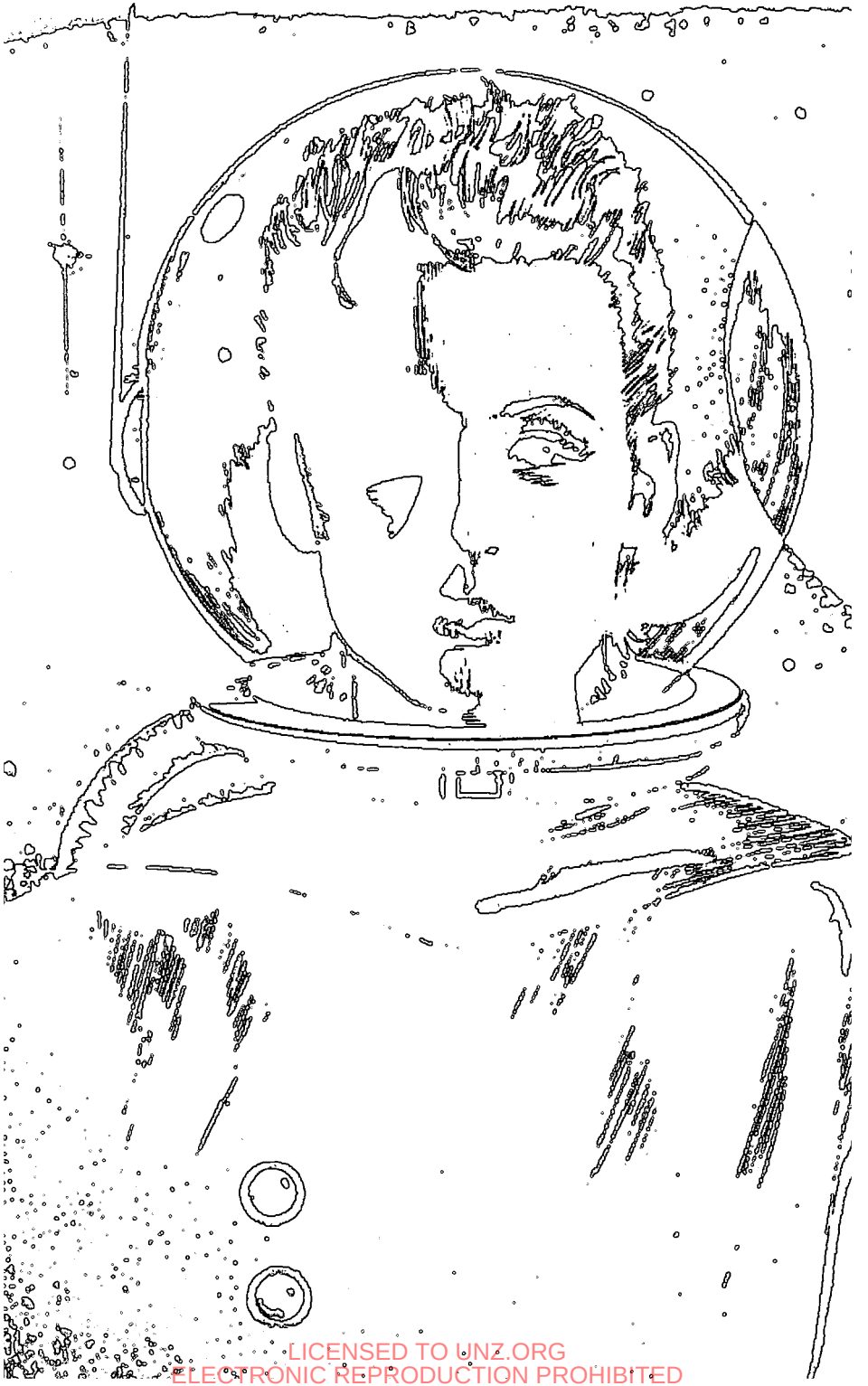

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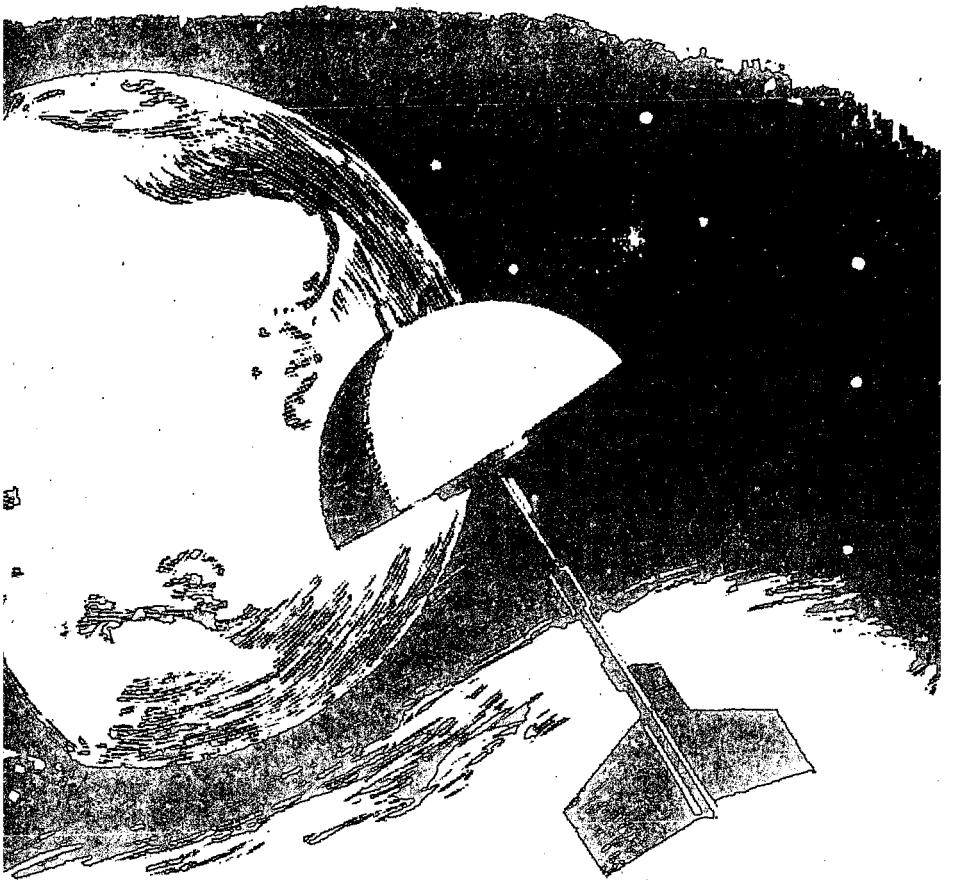

An Old-Fashioned Martian Girl

Conclusion

Mary A. Turzillo
Illustration by Vincent Di Fate

Sometimes a chilling end is really just a prelude to something quite unexpected.

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What Happened in Parts One, Two, and Three

NANOANNIE CENTIME, an out-of-control adolescent, chaffs at her forlorn existence on her family's remote Martian polar pharm. One day, her preadolescent friend ***KAPERA SMYTHE*** *appears at her airlock pleading for help. Kapera's family pharm has been ransacked. Worse, Kapera's bio-researcher parents have gone missing and are wanted on suspicion of murdering some new colonists who were going to buy their pharm.*

Kapera must find her parents, because she has leukemia induced by ambient Martian radiation. The Smythes were in the process of selling their pharm so they could take her to Earth for treatment.

Nanoannie hungers for adventure and romance. She's never met ***SEKOU SMYTHE****, Kapera's brother, but Kapera keeps a computer journal to him. Nanoannie hasn't met too many guys her age in the flesh; her only other possible suitor is a corpgeek named* ***ELVIS DARCY****, who she disdains because "he doesn't have any pheromones." So she falls in love with Sekou sight unseen.*

What she doesn't know is that Sekou actually died when he was a toddler.

Stealing her family's Marsplane, the Origami Firefly, *Nanoannie flies to Kapera's rescue. But Utopia Limited, a corp that is building the* Chrysalis, *a generation starship, shoots down Nanoannie's plane. While she is trying to escape their clutches, the religious cult the* ***PEOPLE OF THE FACE ON MARS****, who wear Face bindis, little animated replicas of the Face on their foreheads, stage an insurrection, and hijack the* Chrysalis.

Lead by renegade nun ***CRYSTAL SPIRIT****, the Facers plan to launch their own expedition to a habitable extra solar planet called Yggdrasil, which circles Eta Cassiopeia, some twenty light years from our Sun. The Facers also shanghai an assortment of Utopian corpgeeks and hapless bystanders, in order to populate the starship and colonize Yggdrasil. The Facers force the unwilling colonists to board the* Chrysalis *and marry so as to procreate and spread human—and Facer—presence throughout the universe. Nanoannie is forced to marry Elvis Darcy.*

The renegade Facer nuns launch the starship Chrysalis, *carrying Nanoannie, Kapera, and others, into Mars orbit, preparing for a journey of a hundred thousand years.*

Crystal Spirit desperately wants to capture Kapera's parents, because Kapera's mother has developed a ***CRYOSLEEP PROTOCOL****, based on Martian bacterial processes, which would allow the Facers to safely freeze passengers for two hundred thousand years, long enough to travel to Yggdrasil, thus avoiding the expense and complications of a generation starship.*

Kapera is tricked into luring her parents, ***DRS. MARCUS AND ZORA SMYTHE****, from their hiding place on Deimos. Zora Smythe insists that the Cryosleep Protocol is unfinished. However, she agrees to provide the incomplete version of the Cryosleep Protocol in exchange for a ride to the Escalator, a spaceship that will take the Smythes to Earth, where Kapera's leukemia can be treated. But a young Facer punk named* ***E. CAYCE JONES*** *hijacks their shuttle and delivers up the senior Smythes to Crystal Spirit.*

Cayce, an opportunist, is convinced that Zora Smythe is holding back information. And he plans to sell the complete Cryosleep Protocol—and the Smythes—to Crystal Spirit for big money. Dr. Zora Smythe

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thwarts his plan by jettisoning the only copy of the Protocol into space. Now Cayce thinks maybe Kapera can get her mother to give him another copy—if it exists. Maybe he can manipulate Kapera, through Nanoannie.

Meanwhile, Nanoannie is planning an escape . . .

Chapter 37
New Love, True Love

Four hours until the Great Escape. Nanoannie's sleep cycle was completely fuddled, and her chilly nap with Nordupol hadn't been all that refreshing. She couldn't stay awake, she couldn't sleep, she should just close her eyes a minute.

She was dreaming, dreaming, dreaming, this super nice dream.

Oh no I fell asleep.

She stretched, and her injured hand hit the bulkhead. She searched for a curse stronger than "Oh, cuy crap!" Would they ever spin up and get some gravity on here? Were her bones turning to sandyfoam from lack of G? And what was wrong with the *heating* system?

The door chirped again.

That had been what woke her.

"I—" She cleared her throat. "It's locked from outside. " It had to be a friend, somebody who didn't realize understand the way this *flying dungeon* worked.

Maybe the three other couples assigned to this cabin. She shuddered.

Or maybe it was a nun with a sleeping pill, guaranteed for several hundred thousand mears, or until the heat death of the universe.

"It's me," said a voice. "I've got to talk to you."

"Cayce?" Had she been dreaming about *him*?

The port slid open.

"Nanoannie, help me."

A bruise was purpling under his right eye. His suit liner was smeared with blood. He had not replaced his Face bindi with a new one.

"Please," he said. "Hold me."

Hold him? He launched forward and grabbed her. At first the hug was like being tied up with fiberglass cables. But Cayce's body was sexy, with its testosterone-based muscle format and that cologne she tried to ignore. She flashed on her dream. Cayce and she had been entangled. No! Not Cayce. Sekou. Naked, his sex against her thigh, hers alive, weeping with desire.

No.

It had been Sekou. She shook herself. She wasn't used to shaking off the aftermath of erotic dreams. In her former life, sheltered and coddled at Centime Pharm, where love and sexuality were accepted (except when they led to accessing virtual sex sites with men soliciting her to become a Borealopolis hooker), she always luxuriated in erotic dreams, when she was lucky enough to have them.

But Cayce was dangerous. Whose side was he on? Frantically, she thought of the least erotic things she could imagine: math, arguments with Krona and Escudo, dedusting the airlock, getting kidnapped by redsuits.

She felt tears on her neck. Could he be *acting*?

His warmth was delicious; he smelled of spices and fresh sweat. Would Sekou smell like that?

Stop!

"What happened?" All she could think to ask.

"It was really bad," he murmured into her hair.

She pulled away. His eyes showed no surprise, only alert disappointment.

He floated toward her bunk and tried one of the belts around him. "A corp splinter group is trying to get the secret of the Revival Protocol from the Smythes. I stowed away on the ship carrying them to the *Atalanta*.

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The pilot was in on the plot. I got this black eye wrestling him, to get them to safety here."

"Did they arrest the pilot?"

Cayce exhaled harshly. "Not sure. Docking was a big clusterfart. The airlock jammed, and we had to cross in suits. He may be loose on the *Chrysalis*. He could be dangerous."

"What about Kapera and her parents?"

"That's what I want to talk to you about. Zora Smythe threw away the microdisk with the Protocol on it. Just pitched it into open vacuum between the two ships. I can't believe she did that."

"She must have had a reason."

"Maybe. She's in the ship clinic, her hands all skybit. Kapera's father and Kapera herself—I don't know. The Nuns are caring for them. It's been very traumatic."

"So—why are you here?"

He sighed. "Nanoannie, the first time I saw you, I knew I wanted you. But you were so prejudiced against us People of the Face. I may never have another chance to say this. You have to marry me, Nanoannie. We have only each other."

Nanoannie wanted to laugh. But if the escape plan went wrong, she would be stuck marrying *somebody*. Worse, if she said no, Cayce might suspect there was an escape plan.

Or should she let him in on the escape?

"Are you saying you love me?"

He twisted around to look at her, and she realized his eyes were the umber of a storm at twilight. Maybe the same color as Sekou's eyes. "How can you even ask?"

She said, "I don't love you, Cayce. And I won't marry somebody I don't love." Except she had been married to Elvis Darcy. "Willingly, anyway."

"You'd learn to love me. I wouldn't ask much of you until you were sure—maybe even until we get to Yggdrasil."

I'm not going to Yggdrasil, you dim bulb, she thought.

"Just the ceremony. If you decide you can't love me, we'll have it annulled."

"Where's Kapera?" She tried to keep the urgency out of her voice.

"Please. If you don't marry me, I'll steal a soyuzoid and vent it without a space suit."

Stealing soyuzoids struck her as too close to home. Change the subject. "You could find her. You're a Facer; they trust you."

Another heavy sigh. "You keep changing the subject." He somersaulted away and began to bounce from one wall to another. Maybe he was trying to keep warm. "Since you bring up Kapera, I suspect the microdisk in Zora Smythe's ring might not be the last copy of the Revival Protocol data. I think Kapera knows where there's another copy."

The Hyper-K. Nanoannie shivered.

"Maybe. But wouldn't Zora Smythe tell Kapera to dump the other one?"

Cayce somersaulted against the ceiling. Watching him made Nanoannie nauseated. "Maybe she did. But maybe the Smythes still hope they can get off the *Chrysalis* and sell it on Earth."

Surreptitiously, she checked his chronometer as he ricocheted by. How long before she had to go join Nordupol? *Get rid of Cayce*—or else trust him and let him in on the escape.

He said he loved her. But maybe that was to get Elvis Darcy's estate. Would the Utopia Limited computer even recognize her claim to the estate? *He doesn't smell like he came straight from the* Valentina. *He smells like he just had a real, water-type shower, not one of these cat-tongue deals with alcohol-swabs.*

Test him? *Use* him?

"Cayce, find Kapera and I'll pump her."

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He stopped bouncing off the walls. "I'm not sure I can. Crystal Spirit doesn't exactly trust you."

"Then why won't Crystal Spirit let me go back to Mars in peace?"

"Oh, Nanoannie, you innocent thing."

She had a sudden urge to slap him.

He patted her arm. "You're valuable to the Human Diaspora: young, you might be pregnant—"

"I assure you I'm not!"

He peered at her tenderly. "Then—somehow—oh, Nanoannie, it could be you and me—"

"Stop that!" *Careful, careful!* "I mean, later." *Sekou*, she pledged, *if I ever get off this prison ship, I will hunt you down and* force *you to marry me.*

Cayce's eyes shone with hurt and shock.

"Look," she said, "there's somebody else. Somebody not on the *Chrysalis*. He looks like you. I think." She had trouble remembering Sekou's age-progressed image.

"You *think*?"

"Never mind. Anyway, you said you could find Kapera." *Do I dare ask him to find her parents, too? She might refuse to escape without her parents.*

"They're never going to trust you, babycakes."

She considered hitting him. The cold was warping her judgment.

He gave her those kitty-eyes, like Fuzzbutt in begging-for-canned-tilapia mode. She almost expected him to purr. "They'd trust you," he breathed, "if you were my fiancée."

That made ugly sense. "How about I promise to marry you soon as we're on our way to Yggdrasil?"

"They're planning to frost the passengers before we leave the solar system."

"Okay, okay. As soon as we leave Mars orbit."

"You don't comprehend the length of the journey, do you?"

She bit her tongue. "No, I'm a complete virgin. You'll have to teach me—everything."

"So you're my fiancée?"

She smiled, trying not to show too much tooth.

The cabin door closed behind him.

And it was locked again. Only Facers could open them. And maybe Utopia corpgeeks.

Did Cayce believe she would marry him? No, he was just breaking down her resistance. He'd be back, oozing pheromones and trying to get in her pants. Or at least get her to sign so he'd be her heir. Stupid. The shareholders would challenge it sixty ways from solstice.

She was starting to enjoy the game when another thought occurred.

The shareholders wouldn't recognize him as her heir if she wasn't dead. And if she was frosted and on her way to Yggdrasil, she wasn't legally dead, not for another hundred thousand mears.

Was Cayce planning to outlive her?

Chapter 38

Cold

Dear Sekou,

One of the nuns yanked my helmet off. She slapped me—not hard, just enough to be sure I was awake—and strapped me into a bunk. Another nun came with wipes and scrubbed my face.

Micro-g kweez again.

A shame for true, because Walden and those nice Nomads on gave us dinner before we boarded the *Valentina*. The nuns seem forget that folks need to eat. Not that I'm much interested in eating. But Dad needs his strength. Mother too, pleasingly plump though she is.

They separated us, probably so we won't plot an escape. I'm in a cargo bay. I'm not sure if the microgravity

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makes me feel better, or worse.

I do know I can't get warm.

Dear Sekou,

I fell asleep, which felt great. I would like to sleep until Dad rescues us and gets us to Earth Orbitals.

A robotic surgeon was here a while ago to give me some more platelets and some sugar water. But no drugs, I think.

Mother thought the robotic surgeon on Deimos wasn't linked to Marsnet. If it was, this one would think I was allergic to sleeping pills. But I can't tell.

So did I fall asleep because it squirted in some sleeping stuff, or because my brain couldn't stand being awake any more?

Whatever, I feel a zillameter better. If I could only warm up some.

Hm. I think I can undo these straps. I'll search for Dad and Mother. We maybe could escape together.

Who in the dust is that?

About a half hour later:

Dear Sekou,

Cayce came and fetched me.

I'm in the cabin where they keep Nanoannie, like a package of frozen chicken.

Cayce gave me a ship tour and I realized Nanoannie's cabin, for this ship, was first class. Most folks have bunks so small you have to squish together to get any sleep, and the center part is open, like a hallway, so strangers pass right through your cabin to get anywhere else. Screens and white-noise projectors are all they give you for privacy.

But Nanoannie has a module all to herself, designed for eight people, with a real door. They cleared out the other couples so Nanoannie and Elvis could be alone.

I was glad to see her. We hugged, although neither of us is super huggy, having come up on pharms. Cayce grabbed her and gave her a good lip-smacker, but she didn't seem super thrilled over that.

I wanted to ask if she for real and true plans to marry him. I decided not to bring the topic up, since she might have to pretend even harder that she was vibing with him.

He kept taking her hand. She'd invent some reason to pull it away, and then he'd grab it again. He took her skybit hand once, but she flinched, and he didn't make that mistake again. I saw he hadn't given her a ring.

How about him? Did he like her enough to do all the kissing and getting undressed involved in marrying? It's beyond me. I'm just a kid.

He said, "Let's figure out where the extra microdisk of the Revival Protocol is."

Boom. Just like that. He assumed there was a copy, and we could find it.

Nanoannie looked at me as if to say, *get rid of him so we can talk.*

"It has to exist." Cayce sounded like we were playing twenty questions.

"Why?" asked Nanoannie. "Why does it have to exist? Why not just trust Dr. and Dr. Smythe?"

"Nanoannie." Patiently, like she was a little kid.

"I can't help you." Nanoannie folded her arms.

"I guess that's it, then." Cayce sniffed.

He shoved me out in the corridor. Should I slip away? Then I could peep around, like I did in Cydonia. Matter of fact, I was using this very wrist puter to draw as much of the ship as I could remember. It won't link to more modern electronics, but it does have a few functions.

Cayce came out smiling to crack his face, hands clasped above his head, a victory sign.

"You figured out where the microdisk is?"

His smile faded. "Not exactly. Something more personal." His goofy smile

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revved up again.

I'm not stupid. He got her to marry him. Maybe even signed and transmitted right there.

"Do you want me to be a bridesmaid?" I asked.

"Uh, Kapera, we need to talk."

I just looked at him. I didn't need any more "talks."

"It's like this. I told Nanoannie that you're a good kid, and not completely worthless, but she's going to Yggdrasil with me. We're almost married, and she decided you'd best be on your own."

If there had been any gravity, I would have fallen over.

"No way," I said.

"It's true. Not to hurt your feelings, she's getting tired of humoring you."

I wasn't going to cry. I wasn't. "So what happens to me?"

"Gee, I'm not sure. Maybe I could get Crystal Spirit to let you off the *Chrysalis* before we cool the ship down and start the cryosleep process. If you happen to know where the microdisk is, I mean. Or maybe you can stay with us. Nanoannie isn't absolutely against that, she's just tired of playing baby-sitter."

I had a hard time following this. "Why in two moons did she follow me all over Mars? She came to Cydonia and picked me up, then she went to Utopia Limited headquarters—"

"She's a fun-loving babe. Wanted to see Mars, get up to some high times, take you along for the yucks. She figured she owed it to your parents to keep you out of trouble. But now she's going to be a married lady, she figures it's time to strike out on her own. With me, I mean."

Sekou, I don't need this.

"Cayce, I have to find my folks. Since I can't count on Nanoannie, can you arrange a family reunion?" Dad might figure how to escape the *Chrysalis*.

He pulled me to him, gave me a little hug, and said, "You're a good kid, and I'll do what I can." He had this stinky man's perfume on. Why do guys wear that stuff? Is that how he got Nanoannie all swept away?

Something got in my eye. "I thought she was my best friend, even though we're so far apart in age. Guess I assumed too much. "

"Actually, I was a little put off by her attitude. I mean, it's a little cold. But she's my woman, and I have to put up with her if she acts like a bitch."

It's funny. Dad said I shouldn't trust Nanoannie. I wish I could ask you what you think now.

Chapter 39
Colder

After Cayce shoved Kapera into the corridor, Nanoannie asked, "Why is it so dusted cold?" But she knew. "It's the Cryosleep Protocol, isn't it? They're getting ready to freeze us." She suddenly wanted Escudo's warm arms around her.

Even better, she wanted Sekou's warm arms around her. Here, however, the only person with arms of any sort was Cayce, and she had just pushed him away.

"Kapera knows everything." Cayce's voice was hard as vacuum.

"If she knows, why on Mars and two moons doesn't she tell?"

He swung around to face her. "Because she's trying to sabotage the expedition. The whole fate of humans in extra-solar space."

"Why? Why would she do that?"

"It's a matter of selling to the highest bidder. When the Smythes get a high enough offer, then she'll tell us."

"That doesn't seem like Kapera."

"You are sooo innocent." He held up his hand. "Sorry; you're bright and resourceful and you sure can fly that plane. But Kapera herself doesn't know the depths of her parents'

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greed."

"Why would they need more money? They sold their pharm for big bucks."

"Yeah, and then came back and wrecked it and murdered the Naguchis."

"No!"

"Sorry, but they did. The Naguchis are taking the permanent sky-nap."

"That's crazy." Nanoannie tried to laugh. "Next you'll claim they killed Sphynxeye."

"You're warm."

Now she was giggling, a cold, scared giggle. "Right. She killed Sphynxeye. Of course. Are you out of your *cute little male mind*?"

He laughed.

She bit her tongue. She had called him *cute*.

"Listen." He pulled her closer, this time not grabbing her injured hand. "The Smythes are experts at victim-specific diseases."

"I thought he was shot!"

Cayce planted a kiss on her lips, quick and dry. "A story the renegades put out." He gave her a sly, warm look, and moved in for a longer kiss. This kiss turned wet, and she felt her lips opening to him. She went limp, feeling the blood rush to her own personal inner space, the one between her legs. He pressed himself, all warm and hard, against her.

They floated, and she tried to remember how to resist. It felt so good. Especially the fact that he was warm. His hands traveled to the zipper on her suit liner, and he had teased her left tank out of her brassiere and was fondling her before she broke the kiss. "Listen, Cayce, this is a bad idea right now."

"You said you'd marry me."

"I did?"

He planted a kiss on each of her tanks—ZOW!—and zipped her suit back up. "Well, then, later, honeycat."

Wait a minute; I'm not quite through with you. But she pulled herself together. "Cayce, you're playing into their hands. They want us to get pregnant and then frost us and take us to Yggdrasil."

"What's wrong with that? We could be great together. Conquer a new planet."

She turned it over in her mind once more. Mars was great, sure. A new frontier—for her parents. She could follow family tradition and go further, to another solar system.

The Revival Protocol might work.

Say it did work. Would she be pregnant all the time on the new planet? Would she get to explore? She wouldn't mind having a couple kids, sure, but not just one after another, bang bang bang. That's what the nuns had in mind. Maybe the nuns would get to explore the new planet. They were the honchas. But she might be just a brood queen.

Then there was the question of life style. She wanted to dance to trendy music, try out exotic hallucinogens, buy slinky rags designed on Luna. Maybe she could earn money as a commercial pilot. She'd be excellent at that.

But on the new planet? Forget fancy clothes. Wait. She could start her own cantina. Those Mormonite Jesuit babes, Immaculata and Abish, could manage it, find some nuke bands. Or she could be a writer. With Nausicaa Azrael twenty light years away, there wouldn't be much competition.

Her brain felt like somebody had pumped her skull full of helium.

Cayce was watching her. Was his smile predatory, like Fuzzbutt in mousing mode?

Nordupol! Escape plan! *Focus!*

Her body throbbed. Wow, those hormones! Sure was more exciting that those netpimps who offered her a job as a cyber-hooker.

"Marry me," said Cayce.

She tried to scope out if he was still

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excited. "Give me time to decide, say, uh, four hours," she said.

He gazed in her eyes. He was mentally calculating, figuring how to work her! If he would only leave, so she could think!

Sekou, I want you so much!

"Another thing," Cayce said, and now she saw he had gotten control of himself, "If we're going to Yggdrasil together, you have to find the Revival Protocol and give it to Crystal Spirit. Otherwise—we might never wake up."

She was confused. *Thinking with your heart, instead of your head*, her father called it. Her mother called it *the hots calling the shots*. Which was right? She loved Sekou, not Cayce. She imagined a scorcher of a kiss like that with Sekou. Cayce's image superimposed itself over Sekou for a moment, but she pinched herself, and Sekou's playful likeness returned. Never mind that it was a simulation.

"Cayce, I have to ask. Do you just want to marry me to inherit the assets I inherited from Elvis Darcy?" She just wanted to see his reaction.

Cayce's smile faded. "How can you accuse me of that? Anyway, you can't count on inheriting from Elvis Darcy. Forced marriages aren't recognized by the Mars legal machine."

"There would be nobody to say it was forced."

"All the marriages could be challenged."

"When the ship departs to Yggdrasil, we'll be out of range of the Mars legal machine."

"Ah, good you thought of that. Maybe you should record something legal, saying neither you nor Darcy were forced. Some of the marriages were people who planned to get married anyway; this just pushed them ahead. You already knew him, after all."

Elvis Darcy had visited her pharm many times. She had been alone with him for a few hours on the *Chrysalis*. She had established his lack of pheromones.

She wasn't going to tell Cayce any of that.

"I have to go," he said.

Her heart lurched. She needed to be alone, but she wanted to be the one who threw him out.

He continued, "Get some answers out of Kapera. She has that microdisk. Or she knows where it is."

Nanoannie didn't look at the bundle lashed to her bunk.

"I'll send her in," he said. "She's pouting. Cute, but what a brat."

Kapera curled into a protective ball. "I guess I'll be in the way, now that you and Cayce are vibing."

"We're not exactly vibing. What about you? You're going back with your parents now? They have the Revival Protocol, don't they?" Surprise her into admitting that she knows where the microdisk is.

"No," said Kapera dully. "My mother threw it away. It's floating somewhere in orbit above Mars. With our luck, it'll smack into some satellite. And since it has our name on it, we'll get sued!"

"It'll vaporize on impact, stupid" said Nanoannie. "But I thought you had another copy."

"Not so you could notice. Maybe my mother could put together the information from her memory. But Dad says it isn't complete. Half their lab animals never woke up."

Nanoannie snorted. "You think your parents are telling the truth?"

Kapera snapped out of her fetal curl. "My folks don't lie!"

"I didn't mean—" *Change the subject.* "Suppose we could get off the *Chrysalis*. In exchange for the Revival Protocol."

"Say what? You mean Crystal Spirit would help us?"

"I mean—" Nanoannie thought fast.

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"Maybe Cayce could help us. He's a Facer." Kapera's eyes welled with tears. Of course, Nanoannie could go ahead and take her on the escape, as planned. But could she trust her? Was Cayce wrong? Nanoannie could almost believe Doctor and Doctor Smythe were trading lives for money, but Kapera?

Kapera and she had been on-line classmates for two mears, a long time. A quarter of her own life, a third of Kapera's. Her mind did flip-flops. Cayce might be straight up, that was still possible. He was a nuke guy, but she hadn't known him that long. Did he want to marry her in order to inherit?

Who could she trust?

Kapera was Sekou's sister.

But Kapera seldom spoke of Sekou. He seemed alienated from his family. He didn't live with them. Maybe he was the only honest member of the family and the rest were willing to send everybody to a cold death.

"Kapera," she said firmly. "Cayce says you know where there's another copy of that microdisk. They're going to freeze us and we'll be dead if you don't give them the microdisk with the Revival Protocol."

"I don't know, Nanoannie. I just don't know!"

The door chirped and opened. In floated a nun with a tiny, tight round pregnancy, and black eyes set wide in a puffy face. She seemed to lack the usual Face bindi, but when she smiled, Nanoannie saw that one of her incisors had been regrown to look like the Face. It smiled and chortled just like the little pregnant nun.

The toothy-Face nun was towing a turtle-shaped carapace so big the nun had trouble wedging it through the door.

Carapaces, Nanoannie knew from Kapera's residency in one, covered the head and torso. The extremities were left free; why, Nanoannie wasn't sure. Maybe to give your parents something to pat reassuringly while you were dying.

Nanoannie had a horror of having her face covered. And what kinds of attachments were inside that carapace?

Sister Toothy-Face wrestled the machine in and lashed it to a bunk. "Martialle Centime, here's your carapace to keep you comfy during the journey." Then her eye, bright as a lizard's, lit on Kapera. "Oh! Sister Spectral Beneficence, here's another girl. Is that other unit small enough? She masses—oh, twenty kilos."

The other nun, a pale white girl, did not look pregnant. She looked like a *domestic abuse victim, down to a* bruise on her arm. Her Face bindi was scowling. Maybe it was drilling a hole in her skull and stabbing her pain centers to punish her for not being pregnant.

Nanoannie grabbed her bunk. "I'm not going into that thing."

"Oh, my dear," said Tooth-bindi. "You can't stay outside. It's a long, long way to Yggdrasil. You would get very cold. There would be no games to play. No little friends to visit with. No food or air. Do you know how long it takes *light* to get from the *sun* to *Mars*? Almost twenty minutes! And think how fast light flies! Ohmyohmy. But," and she made her puffy little mouth into a melodramatic O, "it would take light *ten mears* to get to Yggdrasil. And do you know how much slower *we* will have to travel than light?"

Nanoannie floated rigid with fury during this speech. Then she answered, "I can fly a Marsplane, you bitch. Don't try to explain interstellar travel to me."

Tooth-Bindi looked stunned. The other nun, the beaten-looking one, rolled her eyes.

Kapera said, "You don't have to explain your raggedy old plot to us."

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Tooth-Bindi flashed her tooth bindi again. "Well, then what's the problem?"

Nanoannie said, "Leave them here. We'll get in them later."

Tooth-Bindi's face closed up, her eyes and mouth turning to tiny tumors like potato eyes. "I think not," she said. "You might not make it in time when the air turns off."

"That's okay, I won't hold you responsible." Nanoannie braced herself to resist.

The other nun said, "Get the little one first. She doesn't look like she's got much fight in her."

"Please," said Kapera. "I want my dad. He can explain."

The two nuns separated the top and bottom of the carapace, like the shell and belly-plate of a turtle, and, holding Kapera's weakly struggling arms and legs between them, closed it, and latched it. Tooth-Bindi then finger-tipped some instructions to the carapace's computer.

Too late, Nanoannie kicked away from the wall and attacked Tooth-Bindi.

The other nun shot her with tanglefoam.

"Now see what you've done!" said Tooth-Bindi. "Did you bring solvent? We can't put her in the carapace like that. She won't be functional when she wakes up on Yggdrasil."

"Oh, for the love of little Phoboans!" Nanoannie fleered. "The tanglefoam will decompose after about a thousand mears!"

"She's right! We can just leave it to dissolve."

Oh no. They were going to leave her tanglefoamed inside the carapace. How would she get loose and meet Nordupol at midnight?

Kapera could talk her way out of this. Kapera, however, was locked in her own, smaller carapace, kicking feebly.

The nuns dissolved the tanglefoam on Nanoannie's wrists so she could be spread-eagled inside the carapace. But after the top of the carapace slammed down over her face, they forced her wrists together over the top of the shell, and she felt the feather touch of more tanglefoam. Her hands were stuck. And her skybit wrist *hurt* from the heat of the tanglefoam's chemical process.

Tubes nuzzled her nose and snaked between her lips. Pinpricks needled her arms. She shuddered. She knew these were harbingers of tubes worming their way into her veins.

And it was *cold* in here. The carapace wasn't going to keep her warm; it was going to freeze her.

Fear took over. The carapace monitor would surely think it was a seizure.

If it thought that, it might give her a sedative. Cold liquids seeped into her stomach. Nausea gripped her. *Think something calming.*

Sekou! They would get pimped up and go to a club. She would teach him the Full Body Rubber Dunk, unless he knew some even better dance step. It would be okay. Somehow she would escape and find Sekou and they would flirt and kiss and get naked. Sex was always calming, except when it wasn't. *Calm down!*

The nuns had to be gone now. Their cheery chatter had stopped. She bit down savagely on the mouth tubes. "LLLUUURRLLGGGGH," she heard her voice say.

A tiny voice from far away said, "You're still awake?"

Nanoannie couldn't say anything. Tubes clogged her throat.

If she could turn her head enough, it might drag the tubes out. But would she rip out her vocal cords in the process? She tried it. It hurt, bad.

But she was getting rid of the tubes. They scraped her throat and she gagged.

Stop it! she told her throat. Her throat went right on gagging. She

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tried not to think of snakes. She had only seen one snake in her life, in a traveling show in Borealopolis, but the barker said they were Bad Things. Like Sand Vampires, only real.

Sekou, Sekou, Sekou!

Gagging helped dislodge the thing. If she ever got her hands on Sister Toothy-Face, she'd knock that tooth bindi down her throat.

Tubes slithered out of her mouth, leaking salty, cold gel.

"Cuy crap and dust!" Nanoannie said. Her throat hurt. And she was afraid the salty gel would to fill up the head space in the carapace and drown her.

"How did you get the tubes out?" Nanoannie asked.

"I bled," said Kapera.

"Huh? How'd you do that?"

"Not on purpose. My mouth is super fragile because of the leukemia. This thing stopped before it shoved them down my throat."

"How about the other tubes?"

"Same deal. It's still trying to adapt to a person with leukemia."

A suspicion crossed Nanoannie's mind. Maybe the carapace hadn't intubated Kapera because Kapera was in on the plot. Maybe Kapera wasn't to be frozen. Maybe she was supposed to pick Nanoannie's brain about—what? "You still can't tell me where the other microdisk is?"

"No. I'm so sorry. My mother might have left it at the pharm, but bio microdisks are radiation sensitive, you know, and the whole pharm was hot."

Of course she *would* say that.

"We have to escape," Nanoannie moaned.

"I know. I'm trying to think. I can't get my carapace open. Have you tried prying at yours?"

"They've tanglefoamed my hands, so I'm tied together like some sort of a dustydamn solstice present."

"We have to think of something," Kapera said. Her voice sounded weak, as if she was giving up.

Nanoannie mulled over Kapera's credibility. "Can you prove you didn't kill Sphynxeye?"

Kapera groaned. "You were with me when Sphynxeye was killed, weren't you?"

"Yeah, but you could have killed him and then come out to met me."

"I'm too tired and cold to answer that." Then she burst out, "I can't believe this! We're being shipped frozen an extrasolar planet, and probably going to die on the way, and you accuse me of causing this mess?"

"I don't know who to believe."

"I thought we were friends. Even though you're older and kind of—"

"Kind of what?"

"Hot blooded."

Nanoannie's first reaction was outrage, then she laughed. "I was loyal to you because I liked you. You're smart and brave and you tell super nuke lies. But, Kapera, I have to admit, one of my reasons is I'm in love with Sekou."

A long silence. Maybe Kapera was suddenly frozen. Could it happen that fast? "Kapera, I'm sorry I couldn't rescue you. I really tried. For your sake, not just because you have a sexy brother."

"About Sekou," said Kapera. "I think you'll be disappointed."

Nanoannie's heart jumped. "You don't think he'd like me? He only dates Kiafrican girls? He's homotropic? He's *married*?"

"Worse than that." Another long silence. "I can't tell you now."

Nanoannie's teeth chattered. The icky fluid from the mouth tubes oozed over her cheeks and around her head. She thought, *oh Mars, I'll never get that stuff out of my hair!* She tested the tanglefoam on her wrists again. Just as tight. *Think! Think!*

But she couldn't think. Shivering, she turned her thoughts back to Sekou. "Listen, Kapera. At least introduce us. If he doesn't like me, that's fine,

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but let him make up his own mind." What would she wear? Her wardrobe was dull, thanks to her parents' financial problems. But she could order something. Nuke shoes with those big foam soles that made your ankles look slim, and a fish-scale black plastic coat split up the back to—

First, get loose. Stay alive. All Kapera's fault. No wonder Kapera wouldn't introduce them. Kapera had arranged this so she would die.

It occurred to her that she was losing her mind. The cold was shutting down her brain.

She noticed, with dim alarm, that her teeth had stopped chattering. Wasn't that a bad sign? As from a distance, she heard herself say, "Do you think if we gave them the Revival Protocol they'd let us loose? I could get us a ride to Mars.

Kapera took a long time answering. Her voice was dreamy, full of sleep and saliva. "How could you get us a ride?"

Should she tell? Kapera couldn't be trusted. But who was left to trust? "At midnight. If we can only get out, at midnight we're all going to steal some soyuzoids. They can't stop us all."

"No," said Kapera. "But we can't get loose. I tried, but the carapace just rumbles and clamps down on my chest."

"Tell me again why it didn't put tubes down your throat." Nanoannie could no longer feel her toes.

"It thinks I'm allergic to everything. I told the one on Deimos I was allergic to all kinds of stuff. This one's asking Marsnet how to put me to sleep without poisoning me."

Nanoannie came awake. "But you're not allergic."

Kapera said carefully, "Of course I am. I'll die if it puts that stuff in my stomach or lungs."

"What would happen if I told it I was allergic?"

"Try it."

"Allergic! Allergic!" She tried to shout it, but she was so cold. The ship had cooled down, and the carapace was even colder.

Nothing happened. Tubes squirmed toward her face. She clenched her teeth, and they probed her lips. One tried for her nostrils, and she thrashed her head back and forth to evade it.

Kapera said after a while, "It was listening. It's only an AI, but it knows you were faking."

Nanoannie groaned, and a tube slipped into her mouth. She bit it savagely, almost cracking a tooth. By turning her head to the extreme right she could jam her nose and mouth so tight against the shell that there wasn't room to stuff the tubes in. How long she could hold that position? Her neck cramped. And she couldn't feel her fingers anymore.

"We may not be able to talk any more, Nanoannie. I'd like to settle one thing. You think *I* murdered Sphynxeye. But my daddy says *you* were in the right place at the right time. I think you're innocent, though. Is it stone cold in here, or is it me?"

Nanoannie was afraid to answer. She had the tube clamped between her teeth so it couldn't slither further into her mouth.

"I had some big dreams, Nanoannie. Exploring Valles Marineris. Climbing Olympus Mons. Learning to fly a Marsplane, even. Seeing some Earth animals in person, maybe even touching their fur. It's not the same in those virtual petting zoos. What does your kitten feel like? Can you describe it?"

Nanoannie clamped harder on the tube.

"I forgot. You're trying to keep the tubes out of your mouth. I just wondered if a kitten feels like a baby. Of course, I don't know what babies feel like. And probably never will."

Nanoannie growled through clenched teeth.

"Nanoannie? Are you trying to

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cheer me up? Okay, listen. If we ever get back to Mars, please, may I pet your kitten?"

Nanoannie bit through the tube, and it retracted. The retreat was only temporary, but she shook her head. "Kapera, I have to tell you about the kitten."

"It died?"

Nanoannie giggled, and the giggle turned into a cough. "The kitten—Fuzzbutt is his name. The kitten—is a hologram."

"*What?*"

"If you want real cats, you have to go to Earth. Or Borealopolis Zoo, although they don't let people pet that cat. It's kind of demented. It went totally global from microgravity, and never really recovered."

Kapera was quiet. "Nanoannie, I'm going to tell you about my brother now. Don't open your mouth again. I mean, unless you figure out some way of escaping. Tap if you understand."

Nanoannie tapped.

"I'll make this short. I need all my breath, in case we figure out how to get out of these turtle shells." Kapera sighed. "I never knew Sekou. My mother always talked about this older brother who was such a hero. Learned to read when he was less than two. But he got Hodgkin's lymphoma from cosmic rays. It's not exactly like leukemia, but just as bad. They sent him to Earth. That's what they said, anyway.

"Well, when I got leukemia, the only cure was nanotech treatment at Earth Orbital Hospitals. But my folks couldn't afford that. Well, they could, but only one of them could go with me. And we wouldn't have money to come back to Mars."

Nanoannie could no longer feel her legs. The cold was turning to a pleasant warmth. She was freezing to death.

Kapera continued. "I ran away. I planned to find the Sojourner Rover from Earth back in the twentieth century. I'd sell it for a lot of money for round trip tickets for me and *both* my folks. A *lot* of money."

Sure, thought Nanoannie dreamily.

"I started a diary, to remember Mars, in case I couldn't come back. You know, if I didn't find the rover. Because no corp is going to pay passage to Mars for a girl who had leukemia."

Nanoannie tried to stay awake. *Contact Nordupol?* No, Nordupol was probably trapped in his own carapace

Kapera's voice went on. "I wrote the entries like a letter to Sekou. My big brother."

By supreme effort, Nanoannie flexed her fingers. This distracted her enough that one of the tubes threaded into her mouth and started oozing cold gel. She gagged, then passively let the slimy stuff flow into her stomach.

Kapera's voice became fervent, despite the cold. Maybe the carapace still wasn't infusing Kapera. "I began to think of him as a real friend, a real person."

Nanoannie couldn't feel her fingers, but maybe they were bending.

Kapera said, "Sekou passed away when he was two."

Sekou died at age two? Two mears old? No! Nanoannie thrashed, whipping her head back and forth, trying to shriek. The tube disengaged and reeled itself back. "I don't understand. You said he went back to Earth, I can accept that. But how could he be *dead*?"

"I'm sorry, Nanoannie. I don't know how you got the idea he was still around. I had that picture of him in my puter, just a cute little boy—"

"Cute? He was a real meatcandy!" Except she had never seen a holo of him as an adult, just that age-progressed image she'd created herself. And edited.

Kapera's voice came back, slightly

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puzzled. "Did you meet some guy who said he was my brother?"

Nanoannie's heart raced like a rocketplane climbing too high, too fast. Then she had the horrible thought that the carapace software would interpret this as pain and anesthetize her. *Calm down!* But how? Her mantra, *Sekou, Sekou, Sekou*, was silenced, its music drowned out by the cacophony of truth.

She turned her head and wept, bitterly. The tears felt hot, then icy as they around her eyes, adhering by surface tension.

"I'm sorry, Nanoannie. You saw the picture, and you knew I wrote letters to him. I never mentioned he was dead, because I thought of him as alive, somewhere far away."

The carapace did nothing. Nanoannie floated in darkness, blind, paralyzed. Then, softly, a tube snaked out, between her flesh and the outer shell, and caressed the hollow of her elbow. Painlessly, deftly, it pierced her arm.

Soon, she would sleep. The feed would give her first a sedative, then the cold blood-replacer to keep her flesh pure and uncorrupted for a hundred thousand mears.

"I loved him," Nanoannie said dreamily. "He would have been so handsome, so smart, so brave. We would have married and had super nuke children. I wouldn't have hated the childbirth thing. I would have been brave and not screamed. Our babies wouldn't get leukemia, either."

"Listen, Nanoannie. I'm just a kid, but believe it or not, I know what love is. I know about crushes, too. Girls get crushes on net stars or sports guys, or even on teachers. I know what that feels like. They invent a story in their mind. That's what you did. You invented my brother as he would have been. As a grown man. His memory lives on. I hope you're one of the lucky ones and survive the journey to Yggdrasil and remember him there.

"I'm ailing, so when my carapace opens on Yggdrasil, they'll find just a dried up mummy. But you'll carry on, I hope. Nanoannie, I didn't kill that Doctor Sphynxeye guy! I'm sorry I distrusted you. We're friends forever, now. Please tell me you trust me." Silence. Then she sighed. "It's so cold."

Nanoannie floated. Sweet false warmth flooded her core. The carapace was taking care of her. Maybe she would wake up on Yggdrasil and Sekou would—no, she forgot, Sekou was dead. She cast about for nice things to think about. Maybe she would get a projectile weapon when they got to Yggdrasil and kill Cayce. Yes, that would be a great idea.

"Nanoannie, are you asleep?"

"No," said Nanoannie with difficulty, mouthing words around the tube. "But I think I know where the microdisk is."

"In my Hyper-K? We checked—"

"I know. It's in your wrist puter."

Kapera's voice carried a frown. "The wrist puter is so old it won't interface with anything made in the last twenty mears."

"It's *in* the wrist puter. You said your mother tried to pry the case open. She put the microdisk inside the case."

"You really think?"

Nanoannie floated quietly. Lot of good it did them to know now. Maybe she could contact Cayce and exchange it for their freedom. No, too late for that.

"Nanoannie, I can't reach it to open the case and check. But I bet you're right. If only I could get out of this thing."

Nanoannie drifted in and out of consciousness, dreaming of *Zloty banging a spoon on her plate. She hated ground-up cuy. Why did Krona keep trying to feed it to her?* Nanoannie forced herself to remember that she was still trapped in the carapace. The banging was something

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Kapera was doing.

Kapera said. "It's so *cold* in here. But listen, if I break the case on the puter, you can feel if there's a loose microdisk in there."

"What . . . good . . . will . . . that . . . do. . . ?" asked Nanoannie. Her tongue was falling asleep.

"Nothing, I suppose. Unless you think the room is bugged, and they might come for the puter if we scream."

The infernal tube tried to worm its way into Nanoannie's nostril again. She shook it off. It was getting discouraged; it seemed to be learning. Or maybe waiting until she was asleep. "They're too busy to scan the bugs. Their computers are too busy with astrogation and monitoring life-signs of hundreds of people in carapaces."

"Yeah. Oh, well. Your man Cayce, he ran off and left you, right?"

"Yup." She had decided some time ago that Cayce was a traitor. She decided to throw all her trust to Kapera. "This guy and me, we had a plan to commandeer all the soyuzoids at midnight. What time do you think it is?"

"I don't have an implant. Soyuzoids? You could fly one?"

"Does a rover freeze up in the fines? Course I could. Whoo, Kapera, I'm loopy. The cold is making me crazy."

"At midnight? Think hard, Nanoannie. They have to let us loose from these things when we get to Yggdrasil. How?"

She thought. "A timer?"

"Might could be. Listen, how about we try and adjust the timer on each other's carapace? How much time will it take to get to Yggdrasil?"

"I don't know. Just run it to the end of the timer's clock. Worth a try."

Kapera was silent. Then, "My hands are weak. Get me out first, and maybe then I can get you out somehow."

Kapera's carapace bobbed against her head. She tapped to indicate Kapera should move down. "I feel a keypad here. I'm afraid I'll key in something dangerous." Her hands were numb. She willed them to bend, and after a few tries, felt tingling, then burning, then stabs of pain. But they wouldn't bend. Miss Toothy-Face and Miss I'll-Suffer-Anything-for-the-Greater-Cause had tanglefoamed her hands.

"Assume it's arranged like any keypad. Numbers on top."

"Yeah, but—" Nanoannie's hands felt like she was wearing gloves made of brick. Her fingers strained against the itchy tanglefoam. At least she could feel that.

The thumb of her left hand, the one that wasn't sky-bit, moved a little. It had escaped being tanglefoamed somehow.

"That's it!" Kapera actually sounded excited. "I can *feel* it with my hoodoo!"

"Feel a computer?"

"Shh. The thing is stupid, but not that stupid."

Apparently it *was* that stupid. Nanoannie ran her thumb over the keypad. Then she gritted her teeth and started entering 9's. A whole string of 9's.

"That's it!" said Kapera. "You did it. I'm free!"

Bumping and scraping sounds. Nanoannie's spirits surged.

"Oh Mars, Nanoannie, it's almost as cold out here. Brrrrr. Now I'll get you out." Kapera worked the keypad, working and working, but suddenly lights flashed inside the carapace in Nanoannie's eyes, and the whole machine vibrated with an alarm.

"Oh Mars," said Kapera. "Nanoannie, are you still awake? It's jammed. Oh no, oh Mars, Nanoannie?"

The tube snaked toward Nanoannie's mouth. She tried to shake it away, but it probed her lips and slid in. The gel was tasteless and cold, and after it slid past her tongue it lubricated her throat. She was too tired to

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gag. Her veins cooled. She felt heavy warmth throughout her arms, her legs, her chest, her throat. And suddenly her body was just *gone*.

She gave herself to the cold as she never had to any human lover.

Chapter 40
Parents and Old Friends

On the Chrysalis, *sometime before midnight, Summer-April 21,2202*

Dear Sekou,

Well, now you've got me in trouble for real.

Who am I talking to? Myself. I know that, and yet I talk to you, dead brother, because I'm scared. You're my "imaginary friend." My ghost buddy.

I talk to you, because, because, because I need to talk to *somebody*.

Is there a way out of this mess, Sekou? If I'm stone quiet, will your ghost send me an idea?

I don't feel my best. And cold! I wrapped myself up in all the blankets in this room, and I'm still shivering! Maybe I should have let the carapace just freeze me. Wake up on Yggdrasil and let the Builders of the Face cure me.

Okay. I know, that's stupid. Got any better ideas?

I hate hate *hate* what happened to Nanoannie. Cayce ran a game on her so he could get Elvis Darcy's money. She loved you, even though you passed when you were little. Now she realizes Cayce is a trifler, but it's too late.

I need to rest a minute. Then I'll try again.

A few minutes later:

Nope. Here's the problem. When those beastly nuns tanglefoamed her arms, they tanglefoamed the keypad on her carapace, too It's as good as broken.

Her hands are all cold and blue. I felt her leg, and it was cold, too.

Has she passed over, Sekou?

I hope she's just frozen, like Mother's lab animals.

Um, some of Mother's lab animals didn't wake up.

If I leave things be, maybe on Yggdrasil she'll wake up all right.

Who am I kidding? Mother says the Revival Protocol bombs half the time.

I could take this wrist puter to Crystal Spirit and tell her the microdisk is inside. I'd open it and look myself, only my hands are so cold they don't work.

And what about this midnight escape?

I think I'll wrap up in more blankets until I'm warm enough to work on Nanoannie's carapace some more. What else can I do?

Oooh, this is interesting.

Sekou, Nanoannie's blanket was folded against the bulkhead. When I pulled it away, I found scratches in the metal. They don't look accidental. They look like some sort of schematic.

Or a map.

Ten minutes later, in corridor Frigga-101 of the Chrysalis.

It *is* a map, Sekou. I don't know where Nanoannie got it, but it looks to be an straight up map of the ship. I'm a few meters outside her cabin.

I checked out the whole cabin and also found my thermos of Hyper-K. Fermentation and the alcohol kept it warm and thawed. I gulped the last swallow and it pepped me up enough to get out of the cabin. Now it's gone and I can't get any more. I don't think the Builders will have any starters for the stuff. But I had to choose—it wouldn't do me much good if I froze.

The nuns forgot to lock the door. My wrist puter is pretty primitive, but it takes old fashioned flat pictures. So I photoed the wall scratch map to find my way. I can project it against a wall if I get lost. Plus, my hoodoo sense tells which way hallways end, how

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long they are, and whether they dead end. Echoes.

I wish Nanoannie was with me. She had a boss sense of direction.

First, our folks. The nuns can't have them hidden all that well.

The *Chrysalis* has gangways running through strings of cabins. The cabins are like hollow beads, and the gangway is like the hole you string the bead through. You go through the gangway, pulling yourself along ladder rungs, until you get to the cabin you want—the cabins have number addresses. You enter from the *center* of the cabin.

They aren't super great for artificial gravity—they stick out from a central deck, so you slide toward the bottom of your cabin. When the ship spins for artificial gravity, your bed stands upright. Maybe they go horizontal when the ship has gravity. I reckon that was how it was designed back when Dr. Sphynxeye's Facers were in power. The Sphynxeye faction planned for folks to actually live on the ship. A generation starship, elbow to elbow. Everything would fold up to make room.

Looking at Nanoannie's map, it's clean obvious. Only way it could work.

Nanoannie could figure where they keep prisoners. She's good with maps. I don't know where to begin. Try every door? Which gangways go to habs, and which are utility? They could lock folks up anywhere, since the locks are controlled from someplace central.

I figure Crystal Spirit would keep Mother and Daddy near her office.

Maybe Nanoannie got this map from that Nordupol guy, to plan their midnight escape.

I got wondering why they have soyuzoids in a ship designed to travel twenty light years in deep space. Then I thought, they were for the end of the journey: to travel down to the surface of Yggdrasil to meet the Builders.

But could shuttle-craft like those last a hundred thousand mears? Wouldn't something in them break down? Crystal Spirit and her friends must be fools.

Or, as Mother says, maybe not. They could have nanotech to keep them ship-shape. Nanotech is illegal on Mars, but Utopia Limited could have got a special permit. Or maybe they worked in that shady area between micro and nano.

The corps make the law, so they maybe changed it.

Or maybe not, as Mother says.

One thing on Nanoannie's map is marked super clear: the soyuzoid she was going to pilot in the escape.

The soyuzoids are docked at the ends of corridors. The disadvantage of that, I reckon, is that they might fly off when the ship is up to full spin. The good part is they could use the spin to give the soyuzoids an extra push for landing on Yggdrasil.

Where would Crystal Spirit have her office?

I'll head to the soyuzoid Nanoannie was supposed to pilot. I might meet up with that Nordupol.

Unless he's lying cold and blue and lifeless in a carapace, just like Nanoannie.

Either from the last taste of my Hyper-K or from fear and hope all mixed together, I feel perkier. Microgravity helps; it's easier to get around. Except starting or stopping or turning a corner is just like moving my whole weight. Momentum, I figure. Moving around, I feel warmer. I wrapped a blanket around me, like a cape Nausicaa Azrael wears in those raggedy adventures Nanoannie keeps shoving at me.

Sekou, this is one scary trek I'm taking here. So silent and lonely. True, in our hab, I never used to see anybody except Daddy and Mother for months

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on end. But this is different. These corridors go on forever, lights coming on as you move through them. Not like the tunnels under Cydonia Pyramid, either. I can't put my finger on it. It's like, all the sleepers are breathing really slow behind closed doors, and I'm the only one awake.

Say what?

Maybe I'm not the only one awake.

A minute later:

It's Cayce, Sekou. Why is he awake?

He saw me same time I spotted him, at a corner between hallways. He waved that smart-aleck wave he has, and he's cruising toward me. He's real zippy in the microgravity. Seems to know his way around here.

I don't like that thought.

About fifteen minutes later:

I don't hide the fact that I'm recording in this diary. I subvocalize so he can't tell what I'm saying. Sure, he could have software on his com that would pick up my vibrations, but so what? I'm just telling it like it is.

I know he's trying to get over on me, that's no secret.

He's wearing this fine comfy thermal suit. He said, "Aw, you look kind of cold. You guessed why the ship is cooling down, right?"

I gave him the evil eye.

"Kapera," he said, "time to stop playing games. You know where that microdisk is, and you better give it to me. Otherwise, a lot of people will die."

"I *don't* know," I said. "Plus, I don't know why you're sailing around free when everybody else is locked up in carapaces. Aren't you going to Yggdrasil, like a good Facer?"

"Special assignment from Crystal Spirit. And I might ask you the same question, although knowing what a slippery little mole rat you are, I 'm not surprised."

"If I tell you where the microdisk is, will you take me to my folks?"

He hesitated. "I don't know where your parents are. And you just said you don't know where the microdisk is."

I held out the empty Hyper-K thermos. "You have to break this. It's inside the vacuum liner."

He took the thermos and shook it. "No shit?"

"Go ahead, break it. You'll see."

"I'll take you to Crystal Spirit. She might help you."

"Crystal Spirit wasn't too nice to me before."

"No, no. She'd send you back to Mars if you gave her the Revival Protocol."

I didn't trust him, not a lick, but he could be truthing about that one thing. "What about my folks? What about my trip to Earth orbitals? What about our trashed pharm?"

"Can't help you with your pharm, but Crystal Spirit might trade this—" he shook the thermos—"for your parents."

I didn't enlighten him that Crystal Spirit had scanned the thermos and X-rayed the inside. She wasn't that dumb.

I suspected he even knew the thermos didn't have the microdisk in it.

"I do have another favor to ask you," he said.

Whoopee. I can assist the great E. Cayce Jones, idea broker to Utopia Limited and the Facers. "What favor?"

"Come with me. I need you to witness something."

So we're on our way toward the hub. Cayce has the password to all the cabins. He swiped a warm suit like his for me, only too large, of course.

Still feels fine.

Asgard 1102:

They picked some sorry names for these cabins. Anyway, here I am, with our folks. Unfortunately, I can't wake them.

The "interview" with Crystal Spirit

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was a mess.

"I found her," Cayce said.

Crystal Spirit said, "That wasn't much of an accomplishment. She was about the only other moving object on board."

"Anyway, here she is. And with her, the microdisk." Cayce looked smug.

"I think not. Her parents would have told us if she had it. They pleaded for her life, you know."

Crystal Spirit said "would have"—Like our folks were past tense?

"She has it," said Cayce. "She trusts me, and she told me. Right, Kapera?"

I looked from him to her, scared. Should I say it was in the thermos?

"She's sick, young man. How can you mistreat this child? I'll get a carapace and some crystals for her."

"You can forget that," I said. "Those nasty traps don't work on me."

She frowned, "Why not?"

"Because I'm pre-ten, and I have leukemia. Why do you even ask?"

"The carapace worked before. I'll do some healing on you, and then you'll be ready."

Before I could say another word, she glided out.

Cayce pulled me to him, nose to nose. "I'll convince her to help you, but you have to cooperate. You have to swear Nanoannie and I are married."

"Have you gone completely global? I talked to her, and she's in love with—with somebody else, and what's more, she never gave the least sign she would *ever* marry you."

"She really did promise, Kapera. Listen, when I get to Yggdrasil, I want to be with her. She's my lady. She's so nuke. Please. Just say we took vows in front of you—"

"Since when can you just up and get married by 'taking vows'? I'm not even post-ten, so how could I be a witness? You've gone global!"

"Please. If you tell Crystal Spirit we said vows, she'll marry us by edict."

"No, no, and double en oh!"

His face went hard. "Okay, brat, have it your way. I'll make other plans."

Crystal Spirit came back with a robotic surgeon.

"You are not attaching that thing to me," I said.

"Cayce, can you hold her? Be careful not to hurt her."

Cayce held me around the waist. I tried to squirm away, but I might as well have been fighting that robotic arm outside the *Chrysalis*.

She bustled about setting it up. "I'll figure out what to do with her once we get her leukemia under control. The robotic surgeons can't do much except give her platelets, but the pyramid is strong energy."

She stuck needles into my arms—I don't know how she found veins that weren't used up—and then put a crystal pyramid above me. It hung there, in the micro-g. To put the icing on the cake, she stuck a Face bindi on my forehead. I tried to tear it off, but Cayce held my arms.

"In a minute, you'll sleep," she said gently. "I don't like to see you suffer. This is the most potent pyramid aboard. The Builders will have more powerful technology, but this will do for now.

I refuse to cry, Sekou. I refuse!

Cayce said, "Kapera can witness that Nanoannie and I are pledged to marry."

"No!"

Cayce cocked his head at me. "At least witness you found us naked together?"

Crystal Spirit seemed to be waiting for an answer. I said, "They weren't together like that. I thought they were engaged, but I found out she's strung out on my dead brother."

"Your *dead* brother?" Crystal Spirit's Face bindi made bubble-blowing motions with its teeny mouth.

Cayce said, "She saw us. She's

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just—mixed up in her head."

Crystal Spirit's face went super cold. She went to her table puter and fingertipped. I couldn't see the display, which she cast on the wall behind me, but Cayce raised both arms in a victory signal.

Crystal Spirit said, "How can I say no, since you're *so* enamored? Love marriages, under the circumstances, being so rare. You realize it can be annulled on Yggdrasil."

He smiled fit to split his face. "On Yggdrasil, I'll win her heart."

"I have many responsibilities besides your supposed lovesickness."

Cayce wiped the smile from his face. "This will be recorded on Marsnet, won't it?"

"If it matters, yes. Now, the microdisk."

Cayce produced my thermos. "It's in here."

Crystal Spirit looked at it as if it was a moldy dead tilapia. "Martial E. Cayce Jones, we investigated that avenue."

He hauled off as if to bash the thermos on the edge of her desk. She grabbed his arm.

"It's inside the vacuum liner," he said. "She told me it was."

She sighed. Her Face bindi closed its eyes. "Young man, don't you think we X-rayed it and did sonograms? Anyway, how would it get inside a blown glass vacuum tube?"

He gave her a dust-sucking grin.

She folded her arms. "You've lied again. Get out. I'm not taking you to Yggdrasil."

He was trying to keep his face blank. Huh! So he hadn't *planned* to go to Yggdrasil. "You're sending me back to Mars?"

"Yes. I need young healthy volunteers like you, but you've lied and lied, and I can't trust you."

Cayce was the only person that was going home, and it was a *punishment*?

I said, "What about us other folks who don't want to go?"

Crystal Spirit and her Face bindi blinked simultaneously. "You just *think* you don't want to go. In my heart I know you and your parents really want to go, and all that's stopping you is your leukemia. Isn't that right, honey?"

"No," I muttered. "Nanoannie doesn't want to go, either."

Crystal Spirit smiled, "She's just shy and nervous." Then her expression changed. "But I can't have liars and tricksters aboard. They are a danger. So home you go, Martial E. Cayce Jones. You've failed me."

"But my wife!" Cayce whined.

"Oh. I guess I can annul it—"

Cayce put on this somebody-killed-my-lizards face. "No! I will live the rest of my life alone, thinking of my love far away. I'll be long dead when she gets there, and she can have somebody else. But I'll have my memories."

Crystal Spirit's Face bindi stuck its tongue out at him. "You are a troubled spirit. I won't forestall your complex, tragic fate, though you're a lying little ground-rat."

I muttered, "He just wants to inherit her Utopia stock," but she didn't hear me.

"Rest, child." She pulled me to her chest and, braced against the wall, rocked me back and forth. The IV line pulled half out of my arm, but she didn't notice. "And you," she snapped at Cayce, "get out."

"How?" said Cayce. "I can't pilot a soyuzoid. You want me to flap my arms and fly down to Mars?"

The rocking paused. "You'll think of something." Then she went on rocking. Even though Crystal Spirit was a mean old Red Nun, it felt good to be warm and relaxed. My eyes fluttered close.

That's the thing about Crystal Spirit. Almost as if she's two different people. One is the witch that started all this trouble; the other is the sweet mama that rocks you. I wonder what

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made her like that.

When I opened my eyes, she was gone. I was in this room with two carapaces. Feet and hands stuck out of them, Kiafrican hands rough from working with plants and chemicals and keying puters all sol. One of the larger hands wore a gold ring. A woman's hands stuck out from the other carapace, smaller, softer, and with a pale indentation on the ring finger. I would know those four cold, cold hands, even in the dark. I held two of those hands, and let myself cry a little.

Then I tugged the IV line out of my arm (ouch!) and tried the door. Crystal Spirit forgot to lock it, or else Cayce did me a final favor and keyed it open. I peeked outside. The address was Asgard 1102.

This robotic surgeon, like all others in the known universe, thought I was allergic to sedatives. So my catnap at the bosom of Crystal Spirit had been short.

I talked to Daddy and Mother awhile. Maybe they can hear, though they're cold as Deimos.

If only they could talk back. Maybe they know something that would help.

Nah. We're on our way to Yggdrasil, and I'm not frozen.

Oh no. Now the Facers are piping in holy-sounding music. Crystal Spirit's voice, bumping her gums again. Listen:

Beloved Fellow Travelers—

The temperature of the Chrysalis *is now below zero Celsius and continues to drop. If you are still awake, you may experience discomfort, though it is not yet cold enough to cause death. By midnight, however, you must assume a carapace. A rumor has circulated that we have not provided enough carapaces. This is a hoax. Anyone not assigned a carapace, proceed to the hub deck, where volunteers will fit you to ensure a safe and pleasant journey.*

At midnight, the Chrysalis *will leave Mars orbit. Some of us must stay awake to ensure the safety of all. As leader, it is my duty to enter my carapace after everyone else is asleep. I will not leave my post for several sols into our journey.*

Minor discomfort may result from injection of Cryosleep Protocol gels. To counter this, meditate upon the sixth chord of the pyramid, the Translation Harmonic.

Face bindis have been your inspiration through our long struggle, as well as a symbol to the world of our mission. At colder temperatures, your bindi, a Vivocrypt product, will fall off. On Yggdrasil you will no longer need an outward reminder of your faith.

Our less enlightened comrades of the Face may have waited fifty mears for the Utopia ship, fast enough to be a generation starship. The Builders may have already welcomed descendants of our comrades left behind. Greet these strangers with friendship. It is not true, dear people, that one of us murdered their leader, Professor Sphynxeye. We must stand with them in the presence of the godlike Builders.

The sicky background music is working on my nerves for real. It's that whiny instrument—a pheromone? Theremin?

The holy music swelled. Then:

Let me put to rest rumors that the Revival Protocol is not adequately tested. The developers of the Protocol, Doctors Zora and Marcus Smythe are even now in their own carapaces, confident of arrival at Yggdrasil. They eagerly committed their own daughter to the process.

I tried to believe this. Then I noticed Mother's skybit hand. It looked blue and shriveled, I bet because it had no circulation after they started the Cryosleep Protocol.

She wouldn't have submitted to the

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Cryosleep Protocol if it would damage her hand. She uses her hands in her science work, Sekou.

Was there a microdisk in my wrist puter case? Did it explain a new, improved Revival Protocol?

How far had the cooling gone? Had the carapaces frosted folks to the temperature of deep space? I didn't think so.

The rhodopsin itself is purplish red. Wouldn't it turn folks red? And what about the liquid in their bodies? The gel with the rhodopsin would replace some of it, but surely most of the liquid would just dry up. So they hadn't injected the very last rhodopsin enzymes to turn human cells to spores.

Dad says always to look on the bright side, so I reckon the process isn't beyond recall—yet.

So my mind is made up. I'll find Crystal Spirit and tell her the truth. If the microdisk is inside the wrist puter for real, let her read it and know we can't revive folks.

I hear somebody coming. I hope it's Crystal Spirit. Or do I? Tell me what to do, my brother!

Still later:

It wasn't Crystal Spirit. The voice was different: somebody calling super softly, "Cayce?"

A minute later a pregnant figure cruised clean by the cabin where I was hiding. She didn't notice me, but I recognized her.

It was Ooee.

"Cayce?" she kept calling. Soft, but urgent.

I glided out. Ooee coasted up to me, then stopped herself with a handhold, out of breath. "What are you doing here?" she said.

I said, "You tried to trick me."

Ooee looked at me with these big brown eyes. "It wasn't a trick. We needed your mother's final notes. It was a matter of life and death."

"Now it's just a matter of death, because Crystal Spirit started all the carapaces, and folks are going to *die*."

"Listen," she said, pulling her knees up to her swollen stomach, "your mother was bluffing. She threw the microdisk away, thinking then Crystal Spirit wouldn't even try to go if it meant risking so many lives. Thinking Crystal Spirit would abort the whole mission. "

"I know," I said. "But how come you—"

"Crystal Spirit called her bluff. There's a launch window we have to make to leave Mars orbit, and our solar plant is inadequate to power life support unless we start freezing now. It's a calculated risk."

Calculated risk!

Ooee folded her arms protectively over her belly. "She thought your mother would cough up the microdisk at the last minute. She froze your father first, then told your mother she was freezing you. We wondered why she didn't break then. Is she that unfeeling?"

"She didn't have the microdisk," I said. "She's telling the truth. Only half her test animals survived."

Ooee grabbed a handhold and stopped her slow spin. "And that's why I'm not in a carapace. I'm getting out of here. Cayce promised me—"

"Say what? Cayce? Has he got you strung out and kissy-whipped, too?"

Ooee let go of the handhold. "What do you mean, *too*?"

"What happened to your baby's daddy? The guy in the picture?"

"Puntul? I—Puntul abandoned me. But—Cayce has somebody else?"

"Yup. Nanoannie. My friend. He proposed to her. Don't get too jealous, though. He just wants to inherit Utopia Limited from her."

Ooee's eyes got shiny. "He made me be unfaithful to Puntul. He promised me he'd get me off the *Chrysalis* and back to Mars."

"I thought you *wanted* to go—"

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"Not if my baby and I are going to die!" Her face twisted into an ugly mask of sorrow, but then she took a deep breath. "Cayce betrayed me?"

"He betrayed everybody. Played you like a violin. Played us all like a whole orchestra."

She put her hands over her face. After a long moment, she said, "Why are you out running around? Did you find some way of getting back to Mars?"

"Nope. But listen, you're a red nun. Do you have a puter to read that microdisk, if you got hold of it?"

She looked hard at me. "Give it to me."

"It's—your fingers are stronger than mine." I handed her the wrist puter. "You have to get the case open."

She broke a fingernail and swore in a language her com didn't translate. But finally, it popped open. There, folded up like a frostflower petal, was the microdisk.

We looked at the data together. Ooee didn't understand more than a lick of it, but after we scrolled through, I told her, "It's not too late. We could stop it, and everybody would be okay."

"Say we had that power. Should we?"

I didn't think twice, Sekou. "Yup. You understood enough of that stuff at the end. It's too chancy. Over half the folks will die."

"But that means we'll never get to Yggdrasil."

I lost my cool, which wasn't easy, since I was shivering like mad. "You will, too! You just have to let Utopia go ahead with the antimatter drive. You just can't go there *now*."

"But *I'll* never see Yggdrasil."

"Maybe. Maybe not. But your baby will get a chance, and if not her, your grand kid. Besides, didn't you notice one obvious teeny fact?"

She shook her head, miserable.

I grabbed her by the shoulders and looked in her eyes. "Nobody ever tried it on pregnant animals! For all we know, it might kill *all* of you!"

She looked at me, a look of horror and understanding. "You're right. But there's no way to stop the carapaces. They're centrally controlled by a Vivocrypt AI."

"We have to! They'll kill Daddy and Mother and Nanoannie, and all your friends, and Crystal Spirit and—and you and I are going on a deep space trip with *no life support*!"

"Okay! You're right! What can we do?"

"Find Crystal Spirit. Get her to stop the process."

Ooee's face got stone serious. "She can't. She won't. She hoped she'd get the information out of your mother, but she had to launch now because otherwise the launch window would be lost and she'd never get the immigrants together again. She's willing to lose half of us! "

She started in crying. She's good at that. She cried so hard tears floated free from her face. Would they freeze? Tearsicles.

I thought hard, and something popped into my head. "Ooee, what do the carapaces do if there's a screw-up and the ship gets too warm to use the cryosleep?"

"The carapaces? I don't know. I know they have autonomous fail-safes in them."

I knew that. By pushing your timer ahead past the arrival time on Yggdrasil, you could get the carapace to let you go, like Nanoannie did with mine. But suppose the ship heated up? I asked, "How do they control the temperature of the *Chrysalis*?"

"Oh, it's computerized. You'd never—"

"I remember seeing humongous radiators. They looked like giant stiff flags. Aren't those to throw off extra heat from the sun?"

"Yes, but—"

Remember Nanoannie's map,

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scanned into my wrist puter?

I projected the map on the corridor wall. It didn't show the radiators, but I remembered seeing them when we escaped the wreck of the *Valentina*.

I *saw* them, Sekou. I just hope we get to them in time.

Chapter 41
Ice Dream

Nanoannie was cold, walking outside Centime Pharm without a suit. It was noon, yet stars shone through the sheer pink tent of the sky.

Suddenly she was logged onto math class, yet still out in the environment. "Solve this." The teacher thrust a bundle at her. A miniature rover—holographic, but she pretended to hold it. She didn't want to get in trouble again.

She trekked toward the wreck of the *Origami Firefly*. The rover would fix it. After awhile, the rover got heavy, and soft, like Zloty. This made her sad.

The carapace is malfunctioning! You aren't supposed to dream in a carapace!

She trekked on, sky turning brighter, Zloty getting heavier. Nanoannie peered at her. She had twitchy whiskers. She looked like Fuzzbutt. Maybe she *was* Fuzzbutt; only she was still Zloty, too.

"You're too heavy," she admonished. "You have to get down and walk."

No words came out. *Silly, only Kapera can hear in Mars ambient.*

She put Zloty/Fuzzbutt down.

"Don't leave me!" it said. Nanoannie looked again and the whiskers were gone. It had a face she'd seen long ago, a smiling, precocious Kiafrican boy.

Sekou.

Zloty/Fuzzbutt/Sekou gazed up with great trust. But she was too tired to go on.

***

Chapter 42
The Radiators

Inside an airlock, at the upper stem of the Chrysalis. *23:11 ship time:*

Dear Sekou:

This is the last time I can record in this diary for an hour or so. I hope Ooee's chronometer isn't fouled up by the cold.

Ooee and I have to work together. She spied on me and tried to play me, but we can't be enemies now. Everybody's life is hanging by a filament.

I'm going outside.

"How can this have happened?" Ooee put a hand on her stomach. "Crystal Spirit's willing to gamble with our babies' lives."

"Those carapaces must control the freezing for each travelers by stuff like time and date. Nanoannie tricked them into thinking it was the future. I'm going to trick them into thinking the *Chrysalis* is warming up."

Ooee looked thoughtful. "I don't know as much about carapaces as you."

"I spent a lot of time in them. Anyway, what if the carapaces thought that the temperature came back up to, say, 25°C? The temperature I wish it was right now?" I snuggled in the thermal suit Cayce gave me. It felt pretty good, although my chest was sweaty and ears were cold. A problem you don't get in a good environment suit.

Ooee said, "Hard to say. Maybe they'd assume we'd reached Yggdrasil, or else that somebody had aborted the mission."

"I wish this ship had a thermostat, like our hab."

"Your hab was heated by, what, water from a nuke?"

"Yeah. Before our class studied this stuff, I thought space was really cold. But doesn't the sun heat up ships when they're in orbit?"

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"I don't know. I didn't attend Marsnet classes. My tribe taught us."

When Cayce wrecked the *Valentina*, and I saw the *Chrysalis* from the outside. It was shaped sort of like a collapsible radar dish or umbrella. They keep us in one of the long spokes that stick out from the center of the ship. The engines are at the handle end, way far away from us. And at the center of our end were some big stiff things that looked like flags. I bet those were radiators.

I told her, "The *Chrysalis* has radiators so it wouldn't overheat from the sun while orbiting Mars. But it won't take those radiators all the way to Yggdrasil. They're just extra mass to push."

Ooee said, "You think the radiators are detachable?"

I nodded.

"Well, Crystal Spirit is still very much awake, so I doubt we're can get to the control deck to detach them."

"Still, maybe we could get rid of them."

"How?"

"I dunno. We could go out and look. Wish we had a flame-thrower or an electric saw."

Ooee gave me a look like Mother did when I said I wanted to drive the rover.

Except Ooee was not my mother. Neither as smart, nor as cold-blooded.

"We need suits," I said.

"My suit doesn't fit," she said quickly. "My baby grew a lot this last week. Anyway, I don't know where my suit is anymore. And you never had one."

I was too tired to laugh. "I do have one. It'll still fit."

Ooee's gaze became angry. "You're suggesting that two completely untrained people go outside, do a space walk, and figure out how to wreck one of the homeostasis systems?"

"We can do it. Oh, we probably *can't* do it, but what will happen if we don't try?"

She thought a minute. "We could just go on to Yggdrasil. We'd have a fifty-fifty chance of waking up in about a hundred thousand mears."

"If we were in carapaces."

"I could hunt some up."

"Carapaces don't work on me. I'm too weird. I'm a kid, and they think I'm allergic to the anesthetic stuff. Plus I have leukemia."

"Give me one good reason I shouldn't just find a carapace and leave you to your fate."

"'Cause you can't find one. You see any floating around? Anyway, they have to be the right size and all."

She just floated there, rubbing her tummy.

"Plus," I said, "your baby will die."

She swallowed. "Let's look for your suit."

Crystal Spirit had that suit made so she could send me to Daddy and twist his arm into giving her the Revival Protocol. She would have kicked herself if she had known how I was going to use it.

My guess is that it was at the port with the robotic arm that rescued us from the *Valentina*.

I bared my wrist (ooh it was cold out there) and projected Nanoannie's map.

"What time is it?" I asked.

"Twenty three oh one."

Nordupol and Nanoannie had set their escape at midnight. If other escapees were still awake, they'd take the soyuzoids, half empty, without Nanoannie, or me.

The suit was floating where I left it, Sekou, just shipside of Airlock M. Nobody had checked it out or maintained it. I looked it over, but it wasn't much like an environment suit. Didn't need dedusting, thank Mars. Had about a half hour of oxygen. A million things could go wrong with it. I sure couldn't figure them out, though.

The suit has a com in it, and at least

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I'll be warm enough, until I get killed or something.

I asked Ooee to look it over, give me a suit check.

The suit check was a joke. She didn't have a clue.

I feel pretty good, only a little bit of the old micro-g kweez.

"Are you afraid of heights?" Ooee asked.

"I don't know." But that moment in space between the wrecked *Valentina* and the safety of *Chrysalis* had been way scary.

But something keeps me keeping on. Maybe it was seeing how fine Mars really is, and knowing I want to grow up and live there.

Now, gloves and helmet. This wrist puter will go under the glove, and it won't link to anything. So I'll talk to you afterward.

Let's hope.

Chapter 43
Darkness, Falling, Wonder

Transcript of a space walk performed starting at 23:33, Summer-April 22, 2202, on the aft coping of the Chrysalis. *Speakers are as identified.*

Ooee: Just don't think about it. I checked your suit as well as I could.

Kapera Smythe: I'm not complaining.

(Silence.)

Kapera Smythe: Oh, it's so fine. Nothing like you can see from inside. Mars is turning under us. There are the Tharsis Volcanoes. They look like three black buttons all in a row, and the Tharsis bulge is a shirt made out of gold! Oh, and Olympus Mons! And Valles Marineris—it looks like a long, long piece of writing.

(Silence.)

Ooee: Kapera, do you have the tool bag?

(Silence.)

Ooee: Kapera, talk back!

Kapera Smythe: Ooee, I'm going to fall off. I can't hold on. I'm falling and it's so far down.

Ooee: It's very far down but you're not falling in that direction. You're falling—around the planet. You're in orbit, like the whole ship.

Kapera Smythe: I'm falling! Please, open the hatch. I'm not strong enough to hold on.

Ooee: Don't do this to me, Kapera. I trusted you. Keep your mind on what you have to do! Keep a cool heart!

Kapera Smythe: (hard breathing noises, very fast)

Ooee: Kapera, you are not falling. Close your eyes and grip the handholds.

Kapera Smythe: Okay.

Ooee: You said you weren't afraid of heights!

Kapera Smythe: It's—not the height. It's my leukemia. It makes my head spin.

Ooee: Get hold of yourself!

Kapera Smythe: Be quiet! You're not my boss!

(Silence.)

Kapera Smythe: Okay. I'm not falling any more. Which way are the radiators?

Ooee: Can't you see them? They're *only* about half a kilometer long!

Kapera Smythe: They aren't—oh. Those. Oh Mars. They're so *tall*. They're taller than the antenna on our hab.

Ooee: And you expected—what? All right, can you see the handholds to get over there?

Kapera Smythe: (harsh breathing sounds) Yeah, I can. What's all this other stuff? I didn't realize there'd be all this other stuff.

Ooee: Stuff? What stuff? Make sense, Kapera!

Kapera Smythe: I don't know. Solar arrays. Things that look like crazy rovers. Metal boxes. They all have the Utopia Limited logo on them.

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Ooee: Experiments.

Kapera Smythe: Why would Utopia have experiments on this end of the Chrysalis?

Ooee: I have no idea. You're wasting oxygen, Kapera! Move! Don't forget the tool bag. Move. Move!

Kapera Smythe: You think maybe they were going to improve it?

Ooee: Look at your chronometer.

Kapera Smythe: Yikes.

(Rattling and clanging noises.)

Kapera Smythe (sounding dismayed): Oh, Ooee, this isn't going to work.

Ooee: It was your idea. What's wrong?

Kapera Smythe (sighing): These things are stone big. And there's how many of them? Three on this side, three on the other.

Ooee: Are you there? Can you at least start?

Kapera Smythe: Okay.

(High pitched whining and grating sound.)

Kapera Smythe: Ooee, was this the biggest laser cutter we could find?

Ooee: Did you see a bigger one? Did you see *any* other laser cutter?

(High pitched whining and grating sound.)

Kapera Smythe: If they all take this long, we're fried, dried, and hung out in the fines.

Ooee: Are you almost done with the first one?

Kapera Smythe: The first leg of the first one. They have a triangle base. Three legs stuck to the hull.

Ooee: It's got to work. Got to!

Kapera Smythe: I just hit something.

Ooee: What?

Kapera Smythe: I said I hit something. Maybe diamond fullerene reinforcement, I think that's what you call it. Look, the legs are made of lots tied-together sticks.

Ooee: Braces and cross braces. Hollow support beams. Like a hawk's skeleton.

Kapera Smythe: What's a hawk?

Ooee: Never mind. Keep working.

Kapera Smythe: Oh! I'm through it. One leg down, seventeen to go. Let me drag this over to the other—

(Silence. Creaking noise.)

Kapera Smythe: Ooee, we have problems.

Ooee: What are you doing? The whole ship is vibrating.

Kapera Smythe: No time to explain. I freed one leg of the radiator, and it started swaying back and forth on the other two legs.

Ooee: Swaying? What do you mean swaying?

Kapera Smythe: It's moving back and forth. More and more. Oh Mars, look *out*!

(Loud clanging, like a huge bell.)

Ooee: Kapera what have you done? What was that boom?

(Silence. Heavy breathing.)

Ooee: Kapera, answer me!

Kapera Smythe: Okay. Okay. It teetered back and forth on those two legs. Then it was swaying back and forth, more and more. The legs must be a mite elastic, and the way the power module moved set up a—oscillation—is that the word? . And then it—broke loose.

Ooee: Broke loose.

Kapera Smythe: Right.

Ooee: That's good then. We've only got five more to go.

Kapera Smythe: Look out.

Ooee: What?

Kapera Smythe: Look out. It's tumbling ass over teakettle down the length of the module. Oh Mars! I'm falling off the hull! I can't hold on!

(Background noises. Loud thumps and clanging.)

Ooee: Ravana and all the demons! What did you do? It's banging all over. The ship's going to fall apart!

Kapera Smythe: I'm sorry. I thought it would just float away. Mars, I didn't think it would come loose like

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that and hit the ship. I have to figure out another way to do this. What time is it?

Ooee: Look at your suit chronometer.

Kapera Smythe: I'm scared to. Never mind.

Ooee: There's still time. You have a few minutes.

Kapera Smythe: Help me think, Ooee! Try to pretend you're my friend Nanoannie, and come up with another plan.

Ooee: You thought they were designed to be jettisoned once the Chrysalis was on its interstellar way.

Kapera Smythe: That was my game plan. But that one was bolted right in. There was even this box at the bottom to keep that one leg steady.

Ooee: Are there boxes at the bases of all the legs?

Kapera Smythe: I can't see. I guess.

Ooee: You think they had some sort of release mechanism in them?

Kapera Smythe: How should I know?

(Silence.)

Kapera Smythe: Talk to me some more, Ooee. I'm feeling that falling thing again.

Ooee: Just hold on tight. You can't fall if you hold on. And you've got the tether, even if you let go accidentally.

Kapera Smythe: No no no no no! The whole ship is falling. I'm on this big wall and it's falling into Olympus Mons. And what if I—

Ooee: What if you what?

Kapera Smythe: (gagging noises)

Ooee: Stop, Kapera! Don't vomit! If you do, you're finished.

Kapera Smythe: I can't help it! I'm dizzy! I can't move any more! Bring me in, Ooee, I give up!

Ooee: You'll die if you don't succeed!

Kapera Smythe: I don't care.

Ooee: I'll die. My baby. Nanoannie. Your parents will die.

Silence.

Ooee: Please, Kapera! If not for me, for your parents.

Silence. Then:

Kapera Smythe: Okay. I can do it if I think of Daddy, he says, "Keep on keeping on—" Help me. Yell at me some more.

Ooee: Stop it! Just stop! The ship is in orbit. You're in free-fall, and—I mean, forget about the word *fall*. The ship is not getting any nearer to Mars.

(Whimpering noises.)

Ooee: Just don't look at Mars.

Kapera Smythe: I want to look at Mars. It's so beautiful. I love Mars. I'm going to die up here and I want to just—look at Mars.

Ooee: Well, don't! It's making you dizzy. Look, maybe there's some way to break into the control deck and release those radiators. Or maybe we should just give up and try to fly a soyuzoid.

Kapera Smythe: Are you a pilot?

Ooee: No, but—

Kapera Smythe: Well, me neither, and Nanoannie said those things are not just going to land automatically like fluff in a greenhouse. Anyway, we have to rescue my folks. And Nanoannie.

(Silence.)

Kapera Smythe: Let me look at one of them. Give me a few minutes to get over there.

Ooee: We've missed the midnight launch. Take your time.

Kapera Smythe: I don't have enough oxygen to stay out here much past midnight.

Ooee: I will be patient. My heart will be cool. I will not scream or bounce around bashing against walls.

(Breathing noises.)

Kapera Smythe: It says "explosives" on this one. Why would that be?

Ooee: Because you're hallucinating. You're hysterical.

Kapera Smythe: No, not right now. Spacecraft in the olden days had gadgets to get rid of things they didn't need anymore.

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Ooee: A history lesson. At least I will not die ignorant.

Kapera Smythe: Calm down. The fireworks things are called pyros.

Ooee: As in *pyromaniac.*

Kapera Smythe: Or *pyrotechnic,* like fireworks.

Ooee: You think that's what the boxes are?

Kapera Smythe: There's old-fashioned circuitry coming out of them. If only I could wire them all together.

Ooee: But you don't have any wire to connect them. Or a current to ignite them.

Kapera Smythe: No, I don't. This is so hard. I just feel like passing out.

Ooee: Your oxygen—no, it's okay. Getting low, but it's still okay.

Kapera Smythe (barely audible): All those experiments.

(Silence.)

Ooee: Experiments?

Kapera Smythe: I have an idea. If I can only get moving. I wonder if a high oxygen mix—

Ooee: Don't mess with your life support! It's maximized as it is.

Kapera Smythe: Okay, Ooee, you've got to talk me through this. I can swipe wire from this electromagnet here. I don't know what experiment it was, but I don't care. Ship doesn't need it. Then I'll run wire from one of these pyros to another, until I've got the other five radiators connected.

Ooee: How will you pass a current through the wire to ignite the pyros?

Kapera Smythe: I'll think of that while I'm doing the other. Just keep talking to me so I don't get scared of falling again.

(Banging and scrabbling noises.)

Kapera Smythe: Got it! I almost got electrocuted, but I got the wire. Now to the next radiator.

Ooee: You're where? I can't see you.

Kapera Smythe: That's two of them.

Ooee: You're out of oxygen in four minutes.

Kapera Smythe: I have three of them to go.

Ooee: Give it up, Kapera, you have to come inside.

Kapera Smythe: Okay, I'm at the third one.

(Banging and scrabbling noises.)

Kapera Smythe: How much time did you say I had?

(Silence.)

Kapera Smythe: Ooee? Answer me?

(Silence.)

Kapera Smythe: Ooee! Answer me!

Ooee: Kapera, somebody here wants to talk to you.

Male voice: Kapera, you stupid mole rat, what do you think you're doing out there?

Kapera Smythe: Say what?

Male voice: You know who I am. You let me down in front of Crystal Spirit and how you're trying to sabotage the ship. Give me one good reason why I shouldn't tell her exactly what caused that radiator to fall off the hull.

(Pause.)

Kapera Smythe: Because Crystal Spirit will throw you naked out an airlock? Make you suck sky? Give you a room with a view?

Male voice: Shitfire, am I glad you're never going to live to grow up. You'd be a worse bitch than your mother.

Kapera Smythe: Cayce, if you won't help us, leave us alone.

Cayce Jones: Fine, I'm getting myself on a soyuzoid and going back to Mars. Ooee is coming with me.

Kapera Smythe: Ooee, he can't pilot a soyuzoid. It's too complicated landing on rough terrain. He's not a pilot!

(Silence.)

Kapera Smythe: Ooee, please don't tell me you're thinking of following him.

(Pause, then) Ooee: He might have a chance. Why don't you come inside and we'll try it? It can't be worse than

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tearing the ship apart. What if that radiator hit part of the hab?

Kapera Smythe: Pieces of the radiator. It broke up.

Ooee: Kapera, come back inside. We'll wait for you until you can get through the airlock and unsuited. Maybe those Utopia geeks haven't launched their escape yet.

Kapera Smythe: How is there going to be an escape when everybody is lying around with icky cold jelly stuff in their lungs?

(Silence.)

Kapera Smythe: Ooee? Are you still there?

(Silence.)

Kapera Smythe: Ooee, answer me. Cayce? Are you there? Did you do something to Ooee? Cayce? Cayce!

(Silence.)

Kapera Smythe: All right. Maybe there's nobody there. Or maybe you just aren't answering me. Or maybe my suit com is busted.

Kapera Smythe: I'm done. I can't get those other two. The airlock. Please let the airlock—wait! I have to send the spark to them.

(Pause. Then a shock wave carried through the hull.

Another shock wave.

And another.)

Kapera Smythe: Now. Open the airlock. Ooee? Please answer. Cayce? Did you take her away? Ooee, don't believe him. The airlock—

Chapter 44
In Loco Parentis, Loco

Midnight aboard the Chrysalis. *Way too late.*

Dear Sekou,

Crystal Spirit hauled me into the cargo area and yanked off my helmet so hard she almost tore off my left ear. "Where did they go?"

"I don't know! They left me there! I could have died!"

"What did they put you up to?"

I thought, well, I could get out of the responsibility, but, no, that wasn't right. Lying wouldn't help anybody.

"It was my idea," I said. "Is it getting warmer?"

"Two radiators are still intact, or else we'd be poaching in our own sweat."

I tried not to grin.

"I may have to abort the launch," she said. "The two remaining radiators can't chill the ship enough to implement the cryosleep." Her Face bindi was making stone ugly faces, turning its lips and eyelids inside out and rolling its eyeballs up into its head. They shouldn't make folks look at things like that.

"Your parents," she continued, "obviously cannot supervise you adequately. If we have to return to Mars—as unthinkable as that is—I'll enter a petition of guardianship for your care."

"My parents! They aren't—?"

"Your mother sustained some damage, because of the skybite on her hands."

I pushed away from her. "What are you talking about, guardianship? If my daddy is okay—"

"*Probably* okay. You poor dear child. I know you didn't cook this up by yourself, but don't you see? You've consorted with evil people, who betrayed the *Chrysalis* and the People of the Face and all sapient life throughout the universe." She grabbed my hands. "Let us meditate. The Builders are our comfort, though our lives are destroyed."

I tried to get loose. "I want my father. Is he or is he not okay?"

She looked at me thoughtfully. "What is it about your mother, anyway?"

"I want both my parents. I'm just closer to Dad."

"You need a strong female role model, such as I. "

"Let me go so I can find them!"

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"Those traitors took advantage of your youth and innocence!" Her voice sounded like a tragic heroine in one of Nanoannie's thrillers.

"My parents?"

"No, Cayce and Ooee. I might have known there was something between them."

She still didn't get it. "It was my idea. Cayce was trying to stop me."

"You poor child. Poor little victim. I don't know what lies they told you, but you're safe now. Come, I'll make your remaining hours comfortable."

I went completely global. "My folks are taking me to Earth Orbitals on the Down Escalator. You can't stop us!"

"It's far too late for the Down Escalator."

"*I want my parents!*"

"You still love those murderers. You've known nothing else in your short, tragic life."

"They are *not*! *Not* murderers!"

Her Face bindi smiled thinly. "So you believe. Come, child, and I will protect you."

Chapter 45
Revival

—the robot/child/cat softened and warmed as Nanoannie carried it. Her face was wet. When she raised her head to cough, pillows held her down.

And darkness! She was too cold to be afraid; her heart should be hammering, but it lumbered along slow as her breath.

Then sped up. Darkness still pressed her eyes. She tried to claw away the blindfold, but her arms were wrapped tightly around a hard shell that cut into her flesh, and her wrists were bound together. She was—

—trapped in the damned carapace!

"Welcome to the New Solar System!" said a motherly mechanical voice. "Soon you will board a soyuzoid and descend to Yggdrasil."

The carapace popped open, or tried to. Light flared in a narrow ribbon on either side of her head.

The voice continued, "Make ready to meet the Builders. Their joy will equal yours."

I don't think so, thought Nanoannie. She opened her mouth, and discovered her mouth full of that disgusting gel. She spit and gagged, and the carapace began rotating, her backbone the axis of its spin, so that the gel was centrifuged out of her throat and mouth.

When the dizziness abated, she had time to shudder at how her lungs had been cleared. Probably the awful tubes had sucked them clean.

Her arms hurt like fire, tingling as if she had slept wrong on them. Feeling returned to her legs like electric shocks.

Was she the only one awake? Would somebody come and free her? Surely she was the only person whose hands were tanglefoamed together.

The back of the carapace popped loose and floated free. It bobbed behind her, and by turning her head until her neck hurt, she just barely saw she was in the same cabin.

Her arms were bound around the front of the carapace, pressing it to her face.

The drugs in the gel kept her calm, but the nasty implications of her position dawned on her. Her face was mashed into the carapace lid, and her back was undefended against bashing accidentally against corners of ladders, knobs, and handles.

The drugs began to wear off, and panic rose. If she kicked, she'd spin wildly and might bash the back of her head.

She screamed.

Then fear prickled her exposed back. Maybe screaming wasn't such a good idea. Maybe they had been boarded by sand vampires—

—stop that! Sand vampires are a

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legend made up by Nausicaa Azrael!

—except where did Nausicaa Azrael get the idea for them in the first place?

She slowed her breathing, then spit out more of the gel. Belatedly, she remembered that the stuff would hang in a big blob until it got in her nose. But the carapace spun again, and the gel was sucked into a screen in front of her mouth.

Backing into the cabin door, she found it open.

Find out if anybody else is awake, she thought. She closed her eyes and visualized the layout of the ship. Should she go toward the control deck, in hopes of meeting somebody with tanglefoam solvent? Or might she be arrested by red nuns? After all, she had resisted the cryosleep treatment. Even if the particular nuns she met didn't know that, they'd figure she must be a bad one to be tanglefoamed in the first place.

She groped down a corridor. As she neared the education deck, hundreds of terrified passengers streamed around her. "Kapera?" she called out. "Nordupol?" Anybody!

She was ignored.

"Look, there's one!" said a male voice. Somebody with strong hands and a repulsive sweat odor grabbed her shoulders. Then, one arm around her neck, the voice's owner dug around trying to find an opening in her underwear.

She kicked and bucked, but he held on.

"Leave me be!" she screamed. "I'm Elvis Darcy's wife!"

"Widow Darcy! The last woman who isn't taken!" said the male voice, his breath hot in her ears.

"Nuke-sucker! Fines-for-brains! Rotten cuy guts!" Why couldn't she even curse like an adult?

"They passed out all the women and I didn't get a wife," said the voice, ripping at her waistband. "So you're mine."

A female voice said, "Nanoannie Centime?"

Somebody knew her?

Soft thuds, grunts, and the rough hands let go.

"Hold still," said another female voice. Nanoannie knew these voices.

One continued, "I recognized the sky-bit hand. How is it? I see the Mercurochrome has mostly washed off."

"Get me out of this." Nanoannie moaned.

"Hold very still," said the first voice.

"Sewing kit," said the second. "Never leave home or hab without Mercurochrome and a sewing kit."

Nanoannie twisted her head painfully to the right and saw a girl with abundant curls, a plain face, and a red suitliner: Abish, the Mormonite Jesuit missionary. She still smelled like bubblegum.

The other one, Immaculata, worked on Nanoannie's hands. Sawing, jabbing, picking. Every so often the sharp point missed the tanglefoam and jabbed her skin, but Nanoannie stifled her complaints.

Her arms came free and fell limply at her sides. Then she pushed the carapace aside and whooped with relief.

"How did you get tanglefoamed?" asked Abish.

Nanoannie sighed. "It's a long story. I resisted being put in the carapace. How did you two get swept up in this mess?"

Immaculata spoke first. "After we left your pharm, we decided something odd was going on at Smythe Pharm. When we got there, our hopper developed a fuel cell problem, and some Utopia corpgeeks tried to help us. Ultimately, they took us back to Utopia headquarters."

Abish cleared her throat. "I told you that was weird. Why take us all the way across Mars to Utopia?"

"You were all excited about meeting new prospects and seeing a corp

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headquarters."

Abish punched Immaculata's shoulder, which sent them both spinning.

Nanoannie said, "You think they were trying to 'enlist' you?"

"I wonder if they really *were* Utopia corpgeeks," Abish said darkly.

Nanoannie rubbed her wrists. "So why don't you have husbands?"

Immaculata's eyes widened. "We're Mormonite Jesuits! We can't marry outside the Church."

Abish added, "Some women travel together in groups. In fact, look over there—" Immaculata gestured toward a hovering trio in a sort of purdah with robes of diaphanous green shot through with gold thread. "Women are scarce down there on Yggdrasil. Unless the men can cross-breed with the Builders."

"I don't think they'll want to," said Immaculata. "Have you taken a look at the Face on Mars? Any woman that looked like that—"

Abish continued, "They have to marry us on our terms. Courtship, religious and ethical compatibility, everything. You will join us, won't you?"

Nanoannie sifted this information. "Wait. We're in the Yggdrasil system?"

"Yes! That's what the carapaces said."

Nanoannie shook her head so vigorously spots danced in front of her eyes.

Immaculata said, "We have to be near Yggdrasil. We can't see Mars from any of the ports."

"There's a sun out there. It has to be the Yggdrasil primary," Abish added.

Nanoannie scowled. "Have you looked at the constellations?"

Immaculata's brow furrowed. "The constellations wouldn't change much. Eta Cassiopeia is only twenty light years from Sol."

Nanoannie considered that. "Let's see if we can find something we recognize." They rushed to the observation deck.

"That's Sirius," said Nanoannie. "If we were in the Yggdrasil system, Sirius would be off somewhere else, regardless of more distant constellations. And I bet that's Jupiter there. If we had a telescope—"

"Why can't we see Mars?"

"Maybe we can. What's that brilliant reddish star?"

Abish and Immaculata looked crestfallen. "The carapaces said it's the red dwarf in the Eta Cassiopeia system—"

"It's Mars! The red dwarf would be brighter! We're still in the Solar System! The carapaces malfunctioned." Nanoannie held out her wrists. Fragments of tanglefoam still adhered to her skin and the cuffs of her suit. "This stuff disintegrates in twenty, maybe thirty mears. The trip to Yggdrasil is supposed to take a hundred thousand."

They all stared at her wrists, then at each other. Immaculata spoke first. "Let's track down that blasphemer Crystal Spirit."

Passing through yawning open central deck, Nanoannie glimpsed Nordupol. They were swept apart too quickly for her to hail him. He was with a Facer woman-hunting gang. Nordupol didn't look happy. In fact, she was certain he was wearing handcuffs.

When they arrived at the control deck, Abish whispered, "How will we get in?"

"Not sure," said Nanoannie. But the hatch slid open at the touch of her hand. Inside was chaos. It was clearly the control deck; voice rec, visual display, and digital instrumentation lined most of five walls. Trash littered the room, including a Face bindi that narrowly missed slapping her in the eye with the suction of the hatch opening.

She touched the controls. Nothing. The holo monitors were unchanging when she spoke to them. But from

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what she could see, the *Chrysalis* had left Mars orbit. It was headed toward Eta Cassiopeia.

The controls were passworded, probably by Crystal Spirit.

Grab control of the ship! Panic rising, she fingertipped key controls. But none of her commands made the slightest difference.

At the far end of the deck, she spotted a smaller hatch.

Chapter 46
Political Answers to Technical Problems

Control Deck of the Chrysalis, Yggdrasil Launch Time Sol Five:

Dear Sekou:

Maybe you'll read this at the omega point.

Sorry. I'm tired of hearing Crystal Spirit yammering on about the omega point, but I'm almost beginning to believe it. It's a sight better than Christian heaven, because you arrive at the omega point whether you act good or believe or not. Wait a minute. Maybe we already got to the omega point, and this is it, we're on a ship hurtling toward another star. But where are you?

Never mind.

When we got to the control deck, Crystal Spirit's Face bindi looked ailing or possibly dead. Too bad, so sad. I got so used to reading her emotions by her Face bindi that I forget to look at her eyes, but she herself was pale and her jaw clenching like she was chewing up regolith.

Finally, she said, "My child, your parents have led you in the ways of darkness. The Builders' way is so clear, a path through the magnificent cold deeps. Had you been raised in true spirituality, you would exult in revealing the Revival Protocol."

"About that," I said.

"Yes?" Her Face bindi woke up.

"You might as well have this. This will prove you can't thaw all these folks out if you chill them down to absolute zero." I popped off the loosened back of my wrist puter, dug the microdisk out, and gave it to her.

She went stone still. "All this time."

I nodded.

"Why didn't you give it to me before?"

"I just figured it out, and anyway, I thought I could trade it for my folks' lives. And Nanoannie's." I turned away. "You were going to start freezing folks even if the Revival Protocol didn't work."

"It will work! I just need this microdisk."

"Read it."

She stuck it in a reader and the holo display danced through my mother's research. It's super complicated, but there was an abstract and conclusion.

"Why give this to me now?"

I took a deep, painful breath. "You can't start the Cryosleep Protocol again. The carapaces can't be reset, and how would you force everybody back into them?"

"If only —" Her eyes focused off as if she could see through the bulkhead.

"That's the only copy left," I said. "Treat it with loving care."

"Like you," she laughed bitterly. " I treated you with loving care, and you *blew up my mission*. The greatest journey in human history, and you *blew it up*."

I didn't point out that it was Crystal Spirit herself that had blown up the greatest journey in human history, by hijacking the *Chrysalis* so it could never be a generation starship like it was designed to be.

She scrolled randomly through three-D data graphs, images of organelles, models of heat shock proteins. She probably understood it less than I did. Her lips moved almost silently. "He lied."

Who lied? Except I knew.

"We cannot wait," she said. "This

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ship may be doomed on its present course, but Utopia won't build us another. Vivocrypt—" She broke down. "I'll never see Yggdrasil."

"Your baby might—"

She turned on me like a wild animal. Her motion started her spinning, and she stopped herself by grabbing a handhold. "I'm not pregnant! That adolescent turncoat couldn't even do that right!"

Well, Sekou, what do you think of a woman that'll run around wearing a pillow, just to fool her disciples into believing she's dedicated to the cause?

I figured, *now for real I know too much.*

I muttered, "You could turn the ship—"

"No! I want to know where that freaking Ooee is."

I shrugged, pretty sure Ooee ran off with Cayce, which struck me as stupider than anything Nanoannie ever did.

"She has a com," Crystal Spirit said. "She won't listen to me any more. Call her, tell her you've got a way home."

"But that's a lie!"

"Is it? If we put our heads together—"

"No. I don't have to help you any more. I gave you the microdisk. Tell me where you moved my mother and daddy!"

Crystal Spirit kicked over to the hatch on the far side of the control bridge. It slid open, and there were our folks, in carapaces.

"Ooee," I called. "Maybe we can get back to Mars. Crystal Spirit maybe left some information about running the soyuzoids on automatic pilot." Which wasn't for true a lie.

No answer from Ooee.

I wondered if calling Ooee was a good move. "Ooee, please answer," I repeated.

"Tell her about Cayce and Nanoannie" Crystal Spirit said.

"She already knows about Nanoannie, and how did you know? —" but of course the stupid bugs were everywhere. How had Cayce managed to fool her?

"Remind her. Tell her you think he planned all along to abandon her as he did Nanoannie."

"Listen, Ooee. Cayce proposed to Nanoannie, then bailed and left her tanglefoamed. Suppose he leaves you in the lurch, just like her. Think about it!"

I time-dated the message and closed the link. Crystal Spirit's eyes were full of lightening and storm clouds, but I didn't think it was for me.

"Now we wait," she said. "I'll think about waking your parents. I think they're relatively harmless now."

Harmless, huh. Mother is anything but harmless. And Daddy—well, Sekou, what do you figure?

Ooee did turn up. I was surprised. I reckoned she and Cayce had found some way to get back to Mars. She tried to get away when she saw Crystal Spirit, but the nasty old witch dragged her in.

Crystal Spirit said, "Where's Cayce?"

"I left him in the soyuzoid of deck Loki."

"Does he know you came back to us?"

Ooee began to cry. "Am I a fool? I can't believe what you said, Kapera. He had this scheme. He would inherit money from Nanoannie, because she had tragically died. I thought he was doing it for me."

"What changed your mind?"

"He found out I'm not a pilot."

Crystal Spirit's eyes narrowed. "How did he get the idea you were?"

"I sort of lied. He seemed so impressed by Nanoannie's piloting skill. Actually, I once took the controls when a friend gave me a ride. When Cayce realized I couldn't pilot, he went global. Said I was on my own."

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She noticed tears floating , and brushed them angrily aside. "Why did I think he loved me?"

Crystal Spirit stared at Ooee stonily. "You are a proper idiot."

She locked us in, with Daddy and Mother still in those beastly carapaces.

"I'm going to try something," I told Ooee. I explained about what I had done with the timer on Nanoannie's carapace. I was also thinking that Crystal Spirit had every motive to kill Ooee, and me, despite her promises.

"What if Crystal Spirit comes back?"

"She won't. Did you see her Face bindi? It was baring its teeth and its eyes glowed. I never saw a Face bindi do that before."

I worked on the carapace sensors. They were stone easy, once I figured them out. I just turned them forward until I heard little whirring computer sounds with my hoodoo.

Dad first. He choked and wiped that nasty stuff off his face, then he saw me and grabbed me fit to break a couple ribs. "Sugar! *You* rescued us? It's supposed to be the other way around!"

I started crying. I didn't want him ever to let me go.

"We're still near Mars, Daddy," I said. "Maybe I shouldn't have opened your carapace. Maybe we're stuck on that hundred thousand mear trip."

"No, no, Sugar. You'd be dust once that trip was over." He encircled my shoulders with just one arm and took us both over to Mother's carapace.

Our daddy is so smart. I didn't even have to show him how I'd done it.

Mother looked in pretty bad shape. She coughed and gagged. Then she saw me and tried to grab me away from Dad. "Oh, my sweet little child! I never thought I'd see you again. That evil woman—"

"Hush, Zora. Don't strain yourself. Let's think what to do now. Kapera, is the ship still in orbit?"

I shook my head. "It's headed away from Mars. I couldn't get Crystal Spirit to turn us around. But, Daddy, I went out into space and fixed it so at least they can't freeze us."

Mother hid her face in her hands. "We'll die in deep space!"

She is so melodramatic.

And sometimes too right.

Dad said, "Look, we're not safe from the Facers here."

Ooee had been watching us with her mouth open, like her brain had turned to ice mush. "Crystal Spirit locked us in. We can't get out." She started to cry.

"Come on." Dad gestured at the hatch at the other end of the room. "Let's figure out if we can barricade ourselves in there. Kapera, your mama is ailing. Give her a hand."

Mother shook her head and tried to kick free of the carapace. She held her hand to her chest and winced when I took her arm. Dad had to help us both into the smaller room.

It was just a dressing room, but the door had a mechanical lock. I hoped it would hold, until we found some tools.

Dad was trying to rig hammocks for Mother and me when we felt a whoosh of air from the deck we'd just left.

Somebody was opening the hatch to the control deck.

Chapter 47
Revival and Restitution

Nanoannie listened, flabbergasted, to Kapera's recent exploit. This little hab-rat of a girl, not even old enough to date guys, had gone out and blown the cooling radiators off the *Chrysalis*? And! She'd managed to twist Crystal Spirit's arm into reuniting her with up her parents.

Dr. Marcus Smythe looked grim. "Be that as it may, we need to get out of here. Back to Mars. The Down Escala-

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tor is probably a lost dream now." He put an arm around Kapera and gave her a quick squeeze.

Ooee said, "How did you open the port to the control suite?"

Nanoannie had given that some thought, too. "I've had no trouble with the doors and ports since I woke up. They aren't opening for you?"

Kapera, Ooee, and the Smythes shook their heads.

Nanoannie took a deep breath. She felt a tingle of hope. "Maybe I can solve our problems. But I need to find a guy named Nordupol Wanglee."

Nordupol answered his com in a whisper. He had been dragooned by a roving gang to help them find their way around the ship. Nanoannie lured the gang to the deck and freed Nordupol by convincing the rest of the gang they were still in the solar system, not close to Yggdrasil.

Nordupol looked at the control instruments and concurred. "We seem to be about four sols out from Mars. We're following the course of the Down Escalator. I think we can even see it, if we go to an observation deck."

"Can we turn the craft around, man?" said Nanoannie's father.

"It's possible," said Nordupol. "First, could somebody get me out of these plastic handcuffs?"

Abish's sewing kit came in handy once again. "The fact that the plastic hadn't disintegrated should have told those goons a hundred thousand mears hadn't elapsed."

"They weren't exactly Hawkings," said Nordupol.

"Did you know?" asked Nanoannie. She was feeling pretty clever, herself.

"I was pretty sure. I was on my way to the control bridge when one of those blockheads recognized me as a Utopian corpgeek and 'recruited' me. Let's get started."

Kapera's father said, "You can access control of the *Chrysalis*?"

"No," said Nordupol, "but Nanoannie can. Remember her recent tragic love affair?"

"Which one?" asked Kapera, and Nanoannie wanted to smack her.

But she had figured it out. She only hoped it was true. "I'm the only heir of Elvis Darcy. The marriage was recorded on Marsnet before we left orbit. All the of the forced marriages were. Elvis Darcy is the C.E.O. of Utopia Limited."

"I don't understand why it obeys Nanoannie when it didn't obey Elvis Darcy."

Nordupol said, "It did obey him, most of the time. He just couldn't get it to understand why shareholder profit wasn't always top priority."

Marcus muttered, "It seems capricious."

"Of course it's capricious. It's a computer." Nordupol spread his hands, like a magician showing he has nothing up his sleeves. "True, Utopia Limited may not want to recognize Nanoannie. It may even have deadcrashed after its workforce was kidnapped. The machinery of an A.I. that big needs lots of stroking. But the doors open for Nanoannie."

"Why didn't they open when we were trapped in that cabin?" Kapera asked.

"Because Utopia Limited wasn't sure Elvis Darcy was dead."

Nordupol towed Nanoannie over to a console and directed her gaze into a central display with milky membranous light. As she looked, the light brightened at the center, brighter and brighter, then shattered into emerald, ruby, sapphire, diamond shards which roiled into a million bubbles tumbling over one another in colors so bright they impaled her gaze.

When she tried to jerk her head away, the bright bubbles sizzled her in an circuit of energy. Each color stabbed her brain with a distinct tone

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and scent, like perfume or bleach or fruit, thundering a symphony of her senses. She yelped and tried to blink, but her eyes were stuck open as if glued.

Then the bubbles coalesced into a cobalt field, and the light dimmed.

She rubbed her eyes and looked around. Everyone stared at her. Nordupol said, "Yessss."

She looked from Nordupol's brown eyes to the cobalt field, then back again.

He said, "It recognizes you. Tell it you want to redirect the ship."

Chapter 48

Nanoannie and the Shareholders

Somewhere in the solar system, going super fast:

Dear Sekou,

I don't know what Nanoannie saw as she faced that console. At first I thought it was horrible, that Utopia Limited was going to kill her. But then her face began to—I don't know—glow, as if she had grown up suddenly. She looked like a lion, not like the one in the virtual Bronx zoo, although that one was pretty nuke. I mean a lion in one of those docuvirtuals about the Serengeti.

Nordupol and she worked for hours. She would give permission to the Utopia Limited Corp A.I. to make a maneuver, and then Nordupol would tell the corp how to do it.

We could change our trajectory and return to Mars.

I cheered up a little over that, but my mother said, "If only we could go to Earth instead." She knew I still need my treatment.

I don't want to go to Earth, but I want to live.

Nanoannie said, "Maybe we can do something."

And it turned out we were matching trajectories with the Down Escalator. It made sense. The departure windows were the same for the two spacecraft, because *Chrysalis* was supposed to do a gravitational slingshot maneuver around Earth.

Nanoannie had this bright idea. We were almost exactly matching velocity with the Down Escalator. She said she could preprogram one of the soyuzoids to catch up with the Down Escalator. She talked to the captain of the Down Escalator, and he could remote the soyuzoid—with me and my parents inside—and dock it with the Down Escalator.

Wow. For the first time since this whole mess started, I feel like our folks are safe, and I'm going to get well. It's a pretty fine feeling, Sekou.

But I was still angry over the Facers and their crazy ideas.

Mother's tolerant reaction surprised me, considering the danger they'd put us in. "The Facers created a grand illusion from a shadow. They're not the first to have done that, nor will they be the last."

Daddy's response was even more amazing. "Grand illusions aren't all bad. Consider the question, *what is life*? We have only one data point to study it from, because we never will know if Martian extremophiles spores are related to ones on Earth. When extra-solar planets were discovered, scientists suddenly realized—our solar system is only one data point.

"Now. Imagine, all through history we humans assumed that our way of thinking, our thought processes, our moral judgments, our esthetics, were the rule, rather than the exception." He stopped abruptly.

It was so quiet you could have heard dust settle.

Finally I said it. "Suppose they weren't?"

Daddy said, "Right, Sugar. Suppose we discovered races with no moral concept, or a concept so alien that we couldn't understand it. Say they

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thought it was okay to kill fellow sapients, but a great evil to wear adornments. Or that concealing information was punishable by death. Or that you should kill your parents when you reached puberty. What would that tell us about God, if She exists? Or about how we should live?"

"And the Facers asked those questions."

"Yes. They had the guts to believe that the universe was big enough to hold *things* so strange—thinking things—and that we had to learn from them."

It gave me a lot to think about. Maybe it takes a little craziness to make humanity grow. Maybe if you see a Face where telescopes can't see it, you're for real seeing humanity's dreams.

Mother surprised me again, "My daughter is a dreamer too, only she's got some sense in her head. You watch, she'll go far." I held my breath, thinking now she'd mention about how you, her favorite child that passed away, would have conquered Mars and gone on to visit Ganymede by now, but she just smiled.

I guess she'd always been on my side, just didn't know how to show it.

Speaking of Facers, we found out from a shareholder that Crystal Spirit and Cayce got into a soyuzoid and headed for Mars. At least they seemed to be headed to Mars. Since neither of them is a pilot, I'm afraid they're both dead by now. Oh, and the shareholder said they were holding hands and kissing. To think Crystal Spirit called Ooee a fool!

And what else?

Nanoannie hasn't quite forgiven me about you, Sekou. She stone hates it that you're a figment of her imagination. She showed me the age-progressed holo, and you sure would be a bodacious man. She didn't give you ritual scars, but I bet you would have got some.

The nice thing, the *only* nice thing, about going to Earth Orbitals, is that they have kittens in their petting zoos.

I found out who wrecked our hab.

Nanoannie accessed some secret files. The Utopia Limited corp sent corpgoons to destroy all our research, so the Facers would be forced to use the Utopia Limited generation starship instead of the Vivocrypt plan.

But Mother put copies in her ring and my wrist puter. Thank heaven she's so paranoid.

Can Nanoannie keep a leash on this humongous A.I.? Elvis Darcy guy didn't have such good luck. I don't think he even knew Utopia Limited was going to destroy all Mother and Daddy's research.

She ordered the corp to go out and revive the Naguchis. By luck, both came back okay, although with some memory problems. But those might be from shock.

I have to say goodbye to Nanoannie. But we won't let the time delay stand in the way of our heart-to-hearts.

She'll always be my buddy. Who else understands what we've gone through? Well, except you, Sekou.

Chapter 49
Flying Again

Nanoannie's future was so different from her dreams. Her fantasy of dancing with Sekou at fancy clubs, of wedding him, had been smashed worse than the *Origami Firefly*.

And she had no illusions that her claim to Utopia Limited would be easy to uphold. Elvis Darcy had about a hundred people pretending to his aunts, uncles, cousins, and so on. A few even claimed they were secretly married to him. Not to mention four alleged illegitimate children.

Elvis Darcy's files revealed his ugly side. He had infiltrated Cydonia's infrastructure, and he should have been able to guess how Sphynxeye died.

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The truth was, Sphynxeye had undiagnosed bipolar disorder, a common problem on Mars due to less intense sunlight and a long year. Sphynxeye's many love affairs and his brilliant political leadership were the manic phase of his cycle. But in the depressive phase, he obsessed over the fact that he would never see Yggdrasil, and that his own daughter, Crystal Spirit, opposed his great vision. The coup on the morning that Kapera escaped was the final straw. Sphynxeye had shot himself with a gun given him by Crystal Spirit or Cayce, the latter of whom had been a double or triple agent.

But Elvis Darcy wanted to pin the blame on somebody from the Red faction just to vilify them more. He convinced himself that Sphynxeye was infected with a designer retrovirus that caused depression. His corpgeeks were a little overenthusiastic in selecting Kapera to be framed.

Nor was Nanoannie sure she could control the AI, with its profit-maximizing zeal. But she realized she had to have a serious talk with her parents (who were not on the *Chrysalis*, but back at Centime Pharm watching the net and wringing their hands). Yes, she had to explain that even if she lost Utopia Limited and was a complete pauper, she wasn't going to sell herself to any corp. If she couldn't start a Marsplane transport company, she'd turn Land Ethic Nomad.

Kapera came onto the control deck in her suit liner, looking ill, but also hopeful. "I'm sorry about Sekou."

A pang clenched the deepest part of Nanoannie's heart. "Immaculata and Abish say I'll find somebody like him someday, somebody real and alive. I have to keep believing that."

"It wasn't on purpose."

Nanoannie shook her head. "I truly did love him, you know? But what I loved was something I created in my own brain. So I guess I found all his good qualities in my own self."

Kapera laughed. "I wish I could say that about your holographic Fuzzbutt!"

"If I keep control of Utopia Limited, I might import a real kitten."

"If?"

Nanoannie told about the alleged wives and children.

"He was pretty young for all that!"

"I said, *alleged.* I truly *was* married to him."

"But you never, uh, did the deed with him."

Nanoannie glanced at the console. Bugs were everywhere.

"Never consummated it, you mean? You think I was faithful to your dead brother?"

Kapera looked puzzled, then saw Nanoannie wink. She said, "Hot-blooded as you are, you probably seduced Elvis Darcy instead of vice-versa. What did your folks say when they found out about the *Origami Firefly*?"

Nanoannie winced. "Don't ask. At least I got a shot at some real money." She hoped this would make up for the worry she'd caused them.

Kapera didn't move. "Maybe something better, too."

"What could be better than boyfriends and money?"

"Guts."

True. Nanoannie had once feared everything. Blood. Dirty diapers. Sand vampires. Land Ethic Nomads. But that was before her love affair with a nuke, dead guy. Now, she had the courage to face it all.

"You sure had some heart, Nanoannie."

"You had a heart as big as Mars, hab-rat."

Kapera's com chimed time to say goodbye. No hugs: Earth orbitals quarantine forbade them.

Kapera held up her wrist puter, all put back together, and smiled.

Tears made rainbows in Nanoannie's vision. "Give my love to Sekou." ■

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THE REFERENCE LIBRARY Tom Easton

The Zenith Angle, Bruce Sterling, Ballantine/Del Rey, $24.95, 306 pp. (ISBN: 0-345-46061-8).

The Holy Machine, Chris Beckett, Wildside, $17.95, 242 pp. (ISBN: 1-59224-210-3).

The Ordinary, Jim Grimsley, TOR, $24.95, 368 pp. (ISBN: 0-765-30528-3).

Newton's Wake, Ken MacLeod, TOR, $24.95, 316 pp. (ISBN: 0-765-30503-8).

Ringworld's Children, Larry Niven, TOR, $24.95, 284 pp. (ISBN: 0-765-30167-9).

Bio Rescue, S. L. Viehl, ROC, $22.95, 311 pp. (ISBN: 0-451-45978-4).

Olympic Games, Leslie What, Tachyon Publications, $14.95, 234 pp. (ISBN: 1-892391-10-4).

The Philosopher at the End of the Universe: Philosophy Explained Through Science Fiction Films, Mark Rowlands, Thomas Dunne Books (St. Martin's), $23.95, 276 + xii pp. (ISBN: 0-312-32234-8).

Bruce Sterling has been keeping an eye on the cyberculture from its beginning, and not always as a fiction writer. In the early 1990s he penned *The Hacker Crackdown*, an excellent portrayal of the way law enforcement was attempting to come to grips with the new threats posed by hackers. They didn't have the hang of it then, but they recognized the threat and they were trying. Later Sterling delivered such novels as *Distraction* (reviewed here April 1999), which considered some of the populist implications of the cyberculture.

But now we live in the post-9/11 world of Homeland Security. Law enforcement is more paranoid than ever about computer break-ins, and the job prospects for those who understand computer security are much more rosy than for many other IT workers. But paranoia is not a healthy frame of mind.

So meet Derek Vandeveer, computer science professor, research chief at a major dot-com, computer security expert. He knows where the holes are, and when 9/11 hits, he lets himself be recruited by a government agency. Unfortunately, he doesn't understand people very well. He abandons wife and child and submerges himself in the system. Before long he has lost his shirt in the tail of the dot-com bust, but he is figuring out why a top-secret satellite is having problems (not that the military wants to listen), allying himself with a bloody-handed spook, and interfering with a major cyberwar plot. Fortunately, as **The Zenith Angle** plays out, Vandeveer gains some wisdom, which lets him say for Sterling that the Terror that now rules our lives is but the Dot-Com Bubble by another name. It will pass, for the cyberculture is given to wild enthusiasms that, for all that they can be extraordinarily dysfunctional, are only temporary. Which is not to say that we don't need cyberwarriors such as Vandeveer, for we do, at least temporarily, and they can learn enough while in the fray to tackle more routine distasteful jobs.

As usual, Sterling is well worth your attention.

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A few years ago, I put Chris Beckett's story, "La Macchina," in my *Gedanken Fictions* teaching anthology as an illustration of how negatively people can view science and technology that threatens their self-image. It's not a new point to make, for as science has advanced it has upset the status quo apple cart a number of times, moving Earth from the center of the universe to the edge and from young to old, revealing humans as the descendants of apelike creatures, showing that continents float like ice cubes in a highball, contradicting the constancy of mass and time, announcing that the world was *not* predictable, and in the process infuriating authorities—both religious and academic—who insisted that it just was NOT so! And if it was, then saying so should be illegal. Lately we've been seeing the same sort of thing going on with technologically assisted reproduction (in vitro fertilization got past the "Oh! Horrors!" crowd, but now cloning is taking the heat), genetic engineering, and artificial intelligence.

That last was Beckett's theme in "La Macchina," and his point was that if a robot acts like an intelligent, conscious being, then if we insist that it cannot be (and indeed, if it acts like one, it needs to have its memory wiped and rebooted), we look like idiots. As well as slavers and racists and sexists (who have all looked at intelligent, conscious beings in much the same way). Yet as history has shown, we can come around, and Beckett ended his story with a brief dream sequence featuring a "Holy Machine," a robot that had found a seat in a monastery where it could speak of the chain of being that stretches from inanimate matter to electronic intelligence.

The vein is clearly a rich one. It is therefore hardly a surprise that Beckett should dig deeper and in due time come up with **The Holy Machine**. The theme is much the same, but writ large. Where the reactionaries were local, now they have conquered all the world except Illyria, where rationalist refugees (intellectuals, scientists, and engineers) have built an enclave from which ideological insanity is barred. We see it through the eyes of George Simling, a spineless wimp who tends his mother, scarred survivor of the pogroms that created the refugees, when she overdoes her immersion in virtual reality; wonders when robots wander off; and when he finally discovers the joys of robotic sex and falls for "Lucy," begins to obsess about the hints she shows of developing self-consciousness.

The robots that wander off vanish. George discovers that they cross the border and are crucified. The Illyrian government is concerned, but not about the crucifixions. Robots are just machines, after all. If they aren't working right, they just need periodic prophylactic memory-wipes and reboots. In other words, rationalists can be just as boneheaded as the religious idiots outside Illyria.

When the reboots become law, George steals Lucy and leaves Illyria, trying desperately to keep her true nature concealed while he encourages the growth of her consciousness. He is, of course, doomed to failure, but he grows up, becomes less of a wimp, meets other humans (including Marija, who just may be his future), and sees his actions change the world in a way neatly foreshadowed by the short story.

If Beckett can keep it up, he will soon be as well known for his novels as he already is for his short fiction.

Jim Grimsley's **The Ordinary** is not very ordinary! Indeed, it is an interesting oddity, and it gets odder as it develops.

As it opens, Jedda, trader and translator, is accompanying a delegation from Senal, the world of the Hormlings, through a gate—a stone arch rising from the sea—to Irion, a very different world. Senal is crowded with thirty billion people, commands impressive technology,

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and is fighting an interstellar war against a horde of machines. Irion is only sparsely populated and has very little technology, though Jedda has heard tales of wizards. It is also flat.

As the delegation leaves the shore for the inland realms where they are to meet the queen, Malin, their tech fails. They are no longer in touch with the communications net, or the vast information resources they are used to, and they have to shift from motorized "putters" to wagons. Back home, on the other side of the gate, the communications failure stirs alarm. Military jets are sent to investigate, and the queen objects on the grounds that the Hormlings had promised to keep such tech away from Irion. Not that the tech did anyone much good; the jets crashed at the same place where all the other tech cut out.

Magic? We don't believe in that, says the snotty head of the delegation. But now we have a *casus belli*, and here come the fleets of ships and bombers to subdue all Irion and give its wealth of room and resources to a people who know how to use them properly, and need them badly as well.

So the queen says something like "Shazam!" and all the ships and planes vanish into the depths of the sea. As soon as the suitably impressed Hormlings have been sent home—all but Jedda and a few others—she then closes the gate.

And Jedda gets hauled off to meet Irion himself, supposedly tens of thousands of years old, a wizard indeed, even a god, and learn just what an astonishing place the world of Irion is. For instance, it has a number of peoples, some of which echo neatly the conventions of fantasy. There is a god who made the world and its natives, for reasons that Grimsley hints at but I won't. And it is perhaps not very far at all from Senal.

A previous novel, *Kirith Kirin*, focused on Irion in its past and won the 2000 Lambda Award. Related short pieces have appeared in the magazines. And Grimsley says he is by no means done with telling stories about the setting he has created. Judging from this one, future books will be ones to watch for.

Newton's Wake is the latest of Ken MacLeod's reports on the aftermath of the Spike or Singularity or—as he calls it—the Hard Rapture, when Earth's artificial intelligences exploded into godhood, trashing the planet and enslaving or incorporating large numbers of humans before abandoning the scene and leaving a long string of stargates (the Skein) in their wake.

It opens as Lucinda Carlyle, representative of the clan that took control of the Skein and exploits it for profit and power, steps through a gate to the world of Eurydice. Nice place, she thinks. Occupied, but worth reclaiming. Although there is that kilometer-high machine made of diamond, clearly a posthuman artifact, over yonder. Alas, she soon awakens the machine, the locals prove to have more than adequate weaponry (a blaster that uses cosmic strings? Sheesh!), and she is captive.

She soon learns that the locals are escapees from the Hard Rapture. The diamond machine is the remnants of their ship. And out in space, unbeknownst to her, a mining ship is being taken over by a message from the machine; soon its equipment is manufacturing war machines, apparently for later use. Meanwhile, a local playwright is setting up a show that will remind everyone of old furies (and oh, how he does mix up his history, thanks to the loss of documents when Earth was trashed, not to mention a few centuries of time!). And the Carlyles are prepping for an invasion, though they will have to deal with competing groups such as the Knights of Enlightenment, who arrive on the scene quite promptly.

In due time, having learned a great deal about Eurydice, Lucinda manages to escape to a world where the DK group

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(communists organized into "production brigades") are preparing an ecosystem for the America Online farmers to rape and learns that they have a nifty new sort of starship. From there she makes it home, only to learn that she lost tremendous face when she blew the initial entry to Eurydice. Others are in charge now.

But she's an enterprising sort. Before long she has an ambitious scheme in hand, and if it goes wrong thanks to betrayal and she winds up dead . . . Well, death is an inconvenience, but that's all, thanks to nanotech and mental backups. Soon she's back in play and discovering that reality can be a distinctly strange sort of thing.

MacLeod's earlier books—*The Cassini Division* (reviewed here November 1999), *The Stone Canal* (June 2000), and the *Cosmonaut Keep* series (ending with *Engine City*, reviewed June 2003)—have earned him both praise and awards. This one is a fast-moving adventure that stretches the reader's mind well out into the speculative borders of physics and does nothing at all to harm his rep. Recommended.

In 1970, Larry Niven gave science fiction one of its most cherished conceptions: The Ringworld, a ribbon of matter a million miles across and 600 million miles long encircling a sun and providing a surface area 3 million times that of Earth. If you want lebensraum, you got it!

The last entry in the series, reviewed here in November 1996, was *The Ringworld Throne*. By then, all Niven's fans knew that humanity was descended from the Paks, who have a super-intelligent adult "protector" form triggered by eating a special food ("tree of life," which looks like yams) infected by a special virus not found on Earth; that the Ringworld is inhabited by a great many Pak-descended hominids of many forms (vampires, ghouls, monkeys, etc. . . .); that each protector is insanely dedicated to protecting its own line of descendants; and that local protectors were warring for control of the Ringworld. At the same time, the dominant species of Known Space (humans, Kzinti, and more) have sent ships to the Ringworld, every one of them eager to claim a prize of incalculable value. Fortunately, some protectors were using the Ringworld's meteor-defense system to shoot down any ships that tried to land.

Now we have **Ringworld's Children**, whose setting is simple: Ringworld is surrounded by ships engaged in the "Fringe War." It's a standoff—no one can land, and no one can chase the rest off—but not stable. Louis Wu emerges from the autodoc, nicely repaired after his last adventure, and finds Tunesmith, the ghoul protector (the perfect sort, really, for to protect his bloodline, a ghoul must protect the food supply), busily repairing damage to the puppeteer Hindmost's ship, studying how hyperdrives and nanotech work, and hunting for a solution to the Fringe War problem. Unfortunately, the problem is about to get much worse, for the human ships of ARM (the UN's military body, which seems to think that anything it sees belongs to Earth) have anti-matter weapons, and that's just what it takes to punch large holes in the Ringworld and kill everyone aboard. Not that ARM cares about that—they're more interested in Ringworld tech than in Ringworlders.

And Boom! A hole, vast tides of Ringworld air rushing out into space, and what is Tunesmith going to do about it? For that matter, what can Louis Wu do besides get laid, keep his lies straight, find the last remaining Builder Pak, and stay out of the way?

If you're familiar with the series, you will be delighted with this book. If you're not, you may well wish to find the earlier volumes. If you want more, all I can say is that Niven does a pretty good job of clearing the stage at the end. The props still exist, but they've been pretty well battered and moved around. He

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could haul them out again, and surely to good effect, but it would be more work than usual.

S. L. Viehl's **Bio Rescue** is worth recommending to writing teachers as a way of demonstrating what NOT to do. At the most superficial level, Viehl apparently does not know how to delete, for every time she decided there was an alternative way of saying something, both ways are there, as in:

"'IknowYou'd know,' she said . . ."

". . . swam down to bitethroughsnap the little red ribbon . . ."

Since this is one of the things copy editors are for, and since I'm reading an "uncorrected proof," we can hope these gaffes won't be there when the book hits the stores. But then there are deeper issues, such as the setting, a system with multiple inhabited planets, two suns, and hordes of large moons. It makes great theater, but not good astronomy. Asteroids with volcanic eruptions make great theater too, but asteroids are too small and cold to have molten cores. And there are new elements (arutanium), vastly different intelligent species merrily producing little hybrids, and other signs that if the author knows any science, she doesn't care about scientific verisimilitude.

On the other hand, the cover blurbs Viehl as a "bestselling author," so she must have fans who don't care either. Or who find other features of her writing powerful enough to overcome the drawbacks. What they get here is an awkward attempt to blend military SF with James White's medical SF (the *Sector General* series), but without any medical problem solving. The heroine is Dair, born as the badly damaged child of a plague-stricken alien rather like a porpoise. A human researcher rescued her when her kin would have destroyed her, took her to the clinic, and had her rebuilt with human tissues and organs. As a sign of human lack of respect for the integrity of the local species—even though Viehl asserts that respect a number of times—Dair gains a very humanoid form. Her gillets were rearranged to look like hair, she has arms and legs, and as she discovers when she eventually mates with a local, even her intimate anatomy has been rearranged.

At any rate, Dair is now a SEAL, or "surgically enhanced/altered life-form." When she matures, she commands a fighter squad of other local SEALs, and when the opportunity arises she agrees to shift from fighter work to medevac work. But she promptly runs into political and romantic complications that sort themselves out as she defies orders, teaches a hydrophobic wolflike creature to swim (that's hydrophobia as in water-fearing, not-rabies, though the fellow and all his kind *are* pretty temperish), goes head-to-head with an egomaniac male of her own species, joins him to lead off an attack by local hyperpredators, and winds up mated in a final sappy clinch-and-fade.

I had to struggle to finish this one.

It was no struggle at all to read Leslie What's **Olympic Games**. Ancient Zeus was famous for playing around, but he made a mistake when he seduced the naiad Penelope and then turned her into a tree, for in due time the tree was cut down and Penelope found herself embedded in an elegant door. In due time again, the door made its way to America and became the centerpiece of a country cottage, where eventually a lonely young man called Possum stumbled on the secret of releasing her. Meanwhile, Zeus and Hera made their way to Manhattan, where Zeus kept up his philandering ways, Hera kept on kvetching at him, and one drunken night Hera got knocked up by a beetle.

Go figure. Or join Zeus as he runs off to start up a man's cult, complete with drumming, howling at the moon, and getting plastered on metaxa. Great fun! Especially once he realizes that Penelope is still around. Except that Hera, her

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weirdly deformed son, and a friend or two are looking for him. And Possum and his retarded friend Eddie, who seems destined to become the next Oracle, are standing stoutly in the way.

What's answer to the age-old question of what settles such matters is just what must unman every manly man: a woman's tears. But What's tongue is firmly in her cheek throughout, so we don't have to think she means this as the solution to all the rest of the world's problems.

But still . . .

Is science fiction really the "literature of ideas" that we have fondly called it for Lo! These many years? Philosopher Mark Rowlands agrees to the extent that he has coined a new term—"Sci-phi"—to link SF with philosophy, though he prefers to take his SF from movies rather than print (perhaps because thanks to video rental stores and cable reruns, it may be more available). The result is his **The Philosopher at the End of the Universe: Philosophy Explained Through Science Fiction Films**, wherein he uses *Frankenstein, Star Wars, The Matrix, Total Recall, Terminator, Minority Report, Aliens, Blade Runner, Independence Day,* and *The Sixth Day* to explicate absurdity, the meaning of life, personal identity, free will, morality, the mind-body problem, and more. His aim is to make philosophy accessible, for, he says, people often know a great deal more philosophy—thanks to films like these—than they know they know.

Is he successful? Despite a rather breezy style, he touches on a great many topics in philosophy (he can mention such disparate people as Arnold Schwarzenegger and Immanuel Kant in the same sentence!). I suspect freshman philosophy students would find this book a very appealing substitute for or supplement to their present dry texts, and indeed I plan to pass this one on to the philosophy prof at my college. □

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BRASS TACKS

Dear Dr Schmidt,

Tom Easton's review of Neil Gaiman's republished *Don't Panic: Douglas Adams and the Hitchhiker's Guide to the Galaxy* in your May issue says, "It was time to bring the tale up to date, and so Gaiman has done with great lucidity and even wit." Had Mr. Easton read Neil's introduction to this updated edition, he would have spotted a generous acknowledgement that all the new material in this book—except for said introduction—is by other hands, specifically those of David K Dickson and myself (we are credited on the title page but not, for contractual reasons, on the cover).

It is gratifying to see our lucidity and wit praised, but a little galling to see it misattributed. I feel it is important that David's and my work should be acknowledged, partly because we were not exactly overpaid and partly because it's not really fair if loyal Gaiman fans buy the book thinking they're getting eight new chapters of Neil-penned material.

Might I also take this opportunity to mention that Neil has very kindly penned the foreword to the recently published U.S. edition of my own book, *Hitchhiker: A Biography of Douglas Adams* (Justin, Charles & Co), thus creating the unique situation of two near-simultaneous biographies of the same person, one written by N Gaiman with a contribution from MJ Simpson and one written by MJ Simpson with a contribution from N Gaiman.

Approaching the subject from different angles, the books complement each other and keen fans of Adams—or completist Gaiman-philes—are of course encouraged to buy both.

Yours faithfully,
MJ Simpson
Leicester, U.K.

The author replies ...
I apologize for the slip!

Tom Easton

Dear Sir,

I read "The Sound of the Big Bang" (Alternate View, May 2004) with interest, having both a background of math and a liking for music. The idea of representing the cosmic background radiation as sounds audible to the human ear is fascinating and the article was easy to read and to follow. I was even more delighted to find at the end of the article one of the questions I have asked myself (and been unable to answer), followed by an answer from Mr. Cramer. What a disappointment! To say "the universe has been expanding faster than the speed of light because it has been expanding faster than the speed of light" does not answer the question "how is that possible?" Can matter move faster than light after all? Has the speed of light changed? I add my voice to those who have been asking the question and hoping for an answer: *how is this possible?*

Mary Carpenter
Reading, England

The author replies ...
The speed of light "speed limit" is a restriction that comes from special relativity. It is a "local" speed limit. It requires that no matter or signals can travel faster than the speed of light in any local rest

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frame.

General relativity takes a broader view. It describes an expanding universe in which stars and galaxies in remote parts of space are receding from each other, like ink dots on a balloon that is being inflated. The recession velocity is proportional to the separation distance, so when the distance becomes large enough, the objects recede at greater than the speed of light. This happens without violating special relativity's less-than-the-speed-of-light restriction, because, with respect to their local space, these objects are all moving slowly or are at rest.

General relativity and cosmology tells us that objects in very remote parts of our universe must be receding from us at superluminal speeds. No light from such objects can reach us, because of the Doppler shift. And because the expansion of the universe is accelerating due to dark energy, more such objects are joining this group all the time, and we are being "causally disconnected" from more and more galaxies. The "visible radius" of the universe, referred to in my column, characterizes the volume of the universe in which objects are *not* receding at superluminal speeds, and this represents a small fraction of the whole universe.

Best regards,
John G. Cramer

Dear Dr. Schmidt,

I read with great interest John G. Cramer's Alternate View "The Sound of the Big Bang." What an ingenious and fascinating experiment. Do you suppose that if the "sounds" were analyzed for intelligent content they would say, "Let There Be Light!"

Thanks so much for a wonderful magazine.

Sherman Ross
Sevierille, TN

Dear *Analog*,

Reader Howard Mark ("Brass Tacks," June) mentioned a story that took place on Venus, involving "doughballs," and asked if any other "old-timer" recognized it. Although I'm not enough of an old-timer to have read the story when originally published, I did read it in a later anthology, and so can help Mr. Mark.

The story Mr. Mark remembers is "Parasite Planet," by Stanley G. Weinbaum, published in *Astounding SF* in February 1935. I read the story when it was republished in "Before the Golden Age." (Doubleday, 1974)

It is part of a series of stories about Ham Hammond on Venus. "The Lotus Eaters" is another in that series, which mentions the doughballs parenthetically. If Mr. Mark is interested in finding other works by Stanley Weinbaum, ("A Martian Odyssey" is perhaps the most famous) he can do an online search, now that he has the author's name.

David Richman

Dear Mr. Schmidt:

I write to complain about *Analog*'s publication of the serial *Camouflage* by Joe Haldeman. This drawn-out story of a changeling was poor in several respects.

Although the story occupied approximately one-third of the pages of three issues of *Analog*, the entire storyline can be told in one or two sentences. The piece was very obviously stretched to fit the space allotted. (In my observation this is a frequent fault of "serials.") Rather than being interesting or thought-provoking the plot was that of a run-of-the-mill "B" movie.

A warning regarding "scenes that may be disturbing to some readers" preceded each of the installments of *Camouflage*. What was the reader supposed to do, skip one-third of the book even though he or she had paid the usual price? I don't think it is any exaggeration to say that *Analog* owes its readers a partial refund and an apology.

Your website guide to prospective writers clearly states that *Analog* does not solicit stories that contain gratuitous

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violence or sexual content. *Camouflage* clearly contained plenty of both. The sex and violence were included in a blunt, coarse way, detracting from a story that couldn't afford to lose much.

I am especially disappointed that *Analog* included this tedious piece at this particular time, as I had given a relative a gift subscription to the magazine at Christmas. It had taken some convincing on my part to get him to give pulp science fiction a try. I had assured him that the stories and articles were worth his time. What should I say to him about the 150 pages of tripe taken up by *Camouflage*?

If *Analog* is compelled, by lack of good material, to fill out its pages with stories like *Camouflage* you should switch to bi-monthly or occasional publication. Reading the May 2004 issue, there were many fine stories and articles, such as *Elixir*, *Promises*, *Harpoon*, and *The Future of Transplantation*. Compared to these efforts, *Camouflage* "clanged." It represents an off-key disappointment for your normally top-notch magazine.

Sincerely,
Larry Diersen
Monroeville, PA

I'm sorry you didn't like Camouflage, *but many readers saw it very differently. Probably some of them hated some things you loved. When a magazine has many readers, they all have to recognize that tastes differ and everybody can't be expected to like everything.*

The warnings were attached for the benefit of that significant minority of readers who are put off by a particular kind of content and have indicated they would like to know in advance that a story contains more than the usual amount of it. Obviously this story did, but if you thought it was "gratuitous," you missed many of the author's points. □

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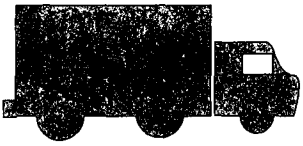

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UPCOMING EVENTS Anthony Lewis

28–31 October 2004
WORLD FANTASY CONVENTION 2004 (Fantasy-oriented convention) at Tempe Mission Palms Hotel, Tempe, AZ. Guest of Honor: Gwyneth Jones. Artist Guest of Honor: Janny Wurts. Editor Guest of Honor: Ellen Datlow. Publisher Guest of Honor: Betty Ballantine. Registration: $160. Info: WFC2004, c/o Leprecon Inc., Box 26665, Tempe AZ 85285-6665; (480) 945-6890; (480)941-3438 (fax); wfc2004@leprecon.org or mwillmoth@compuserve.com; www.worldfantasy2004.org

5–7 November 2004
ORYCON 26 (Oregon SF conference) at Doubletree Hotel Portland Columbia River, Portland, OR. Guest of Honor: Jerry Oltion. Artist Guest of Honor: Mark Roland. Editor Guest of Honor: Jennifer Heddle. Registration: $45 until 20 October 2004, $50 at door. Info: OryCon 26, Box 5464, Portland OR 97228-5464; melcontent@comcast.net; www.orycon.org/orycon26/

26–28 November 2004
DARKOVER GRAND COUNCIL MEETING 27 (Fantasy conference with emphasis on works of Marion Zimmer Bradley) at Holiday Inn Timonium, Timonium, MD. Guest of Honor: Tamora Pierce; Special Guest: Katherine Kurtz. Musical Guest of Honor: Clam Chowder. Registration: $45 (checks to Armida Council). Info: Armida Council, Box 7203, Silver Spring MD 20907; (202) 726-4396; jaelle@radix.net; www.darkovercon.com

26–29 November 2004
LOSCON 31: ESCAPE TO LA (Southern California SF conference) at LAX Marriott, Los Angeles, CA. Guest of Honor: Tim Powers. Fan Guests of Honor: James Stanley Daugherty, Kathryn Daugherty. Info: info@lasfs.org; www.loscon.org/loscon31/

4–8 August 2005
INTERACTION (63rd World Science Fiction Convention) at Scottish Exhibition and Conference Centre, Moat House & City Inn Hotels, Glasgow, Scotland. Guests of Honor: Robert Sheckley, Jane Yolen, Greg Pickersgill, Lars-Olov Strandberg. Registration until 31 July 2004: Attending USD170/GBP 95/EUR 145, Supporting USD45/GBP 30/EUR 45. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Interaction, 379 Myrtle Road, Sheffield, South Yorkshire S2 3HQ, U.K. or Interaction, P.O. Box 58009, Louisville, KY 40268-0009; info@interaction.worldcon.org.uk; www.interaction.worldcon.org.uk.

Attending a convention? When calling conventions for information, do not call collect and do not call too late in the evening. It is best to include a S.A.S.E. when requesting information; include an International Reply Coupon if the convention is in a different country. ■

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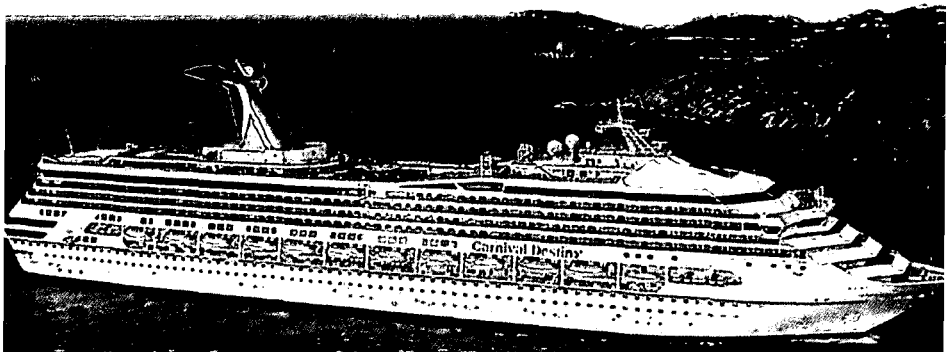

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